Appendix 12.

National Vegetation Classification System (NVCS) for Badlands National Park

(Classification created and compiled from field data by Don Faber-Langendoen and Jim Drake of The Nature Conservancy.)

Juniperus scopulorum / Oryzopsis micrantha Woodland

COMMON NAME	Rocky Mountain Juniper / Little-seed Mountain Ricegrass Woodland
SYNONYM	Rocky Mountain Juniper / Little-seed Ricegrass Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a)
ALLIANCE	JUNIPERUS SCOPULORUM WOODLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Rocky Mountain juniper / littleseed ricegrass woodlands occupy draws and the edges of buttes and tables, scattered throughout the park. The trees are probable hybrids between Rocky Mountain juniper and eastern red cedar.

Globally

This community is found in southeastern Montana, southwestern North Dakota, western South Dakota, eastern Wyoming, and western and central Nebraska.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Rocky Mountain juniper / littleseed ricegrass woodlands occupy dry draws and the small ledges and crevices that occur along crowns of buttes and tables. Draws tend to be steep and incised, and aspect does not seem to play a large role in the community's distribution, as it occupies all aspects.

Globally

This community typically occurs on moderate to steep (16-70%) north-facing slopes, but can occur on a variety of aspects (Johnston 1987, Von Loh *et al.* 1999). The soils are poorly developed, shallow, loamy sands, sandy loams, and clay loams, sometimes with high gravel content. These woodlands are frequently associated with outcrops of sandstone (DeVelice *et al.* 1995) or scoria and clay slopes (Girard *et al.* 1989).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Tree	*Fraxinus pennsylvanica*, *Juniperus virginiana*, *Juniperus scopulorum*
Shrub	*Rhus trilobata*, *Symphoricarpos occidentalis*, *Prunus virginiana*, *Juniperus virginiana*, *J. scopulorum*
Herbaceous	*Maianthemum stellatum*, *Pascopyrum smithii*, *Nassella viridula*, *Bouteloua curtipendula*, *Oryzopsis micrantha*

Globally

Stratum	Species
Tree canopy	*Juniperus scopulorum, Juniperus virginiana*
Short shrub	*Rhus trilobata, Symphoricarpos occidentalis*
Forb	*Campanula rotundifolia, Galium boreale, Maianthemum stellatum*
Graminoid	*Oryzopsis micrantha*

CHARACTERISTIC SPECIES

Badlands National Park

Juniperus scopulorum (Juniperus virginiana), *Oryzopsis micrantha*

Globally

Juniperus scopulorum, Juniperus virginiana, Oryzopsis micrantha

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Pascopyrum smithii*

VEGETATION DESCRIPTION

Badlands National Park

Stands of Rocky Mountain juniper / littleseed ricegrass woodlands typically have very closed canopies, from 50-90% cover. Rocky Mountain Juniper (*Juniperus scopulorum*) and its hybrid with Eastern Red Cedar (*Juniperus virginiana*) dominate the

stands. Under the tree canopy, shrub and herbaceous cover is sparse; however, alongside the woodland and in draw heads shrub cover can be extremely dense. Shrubs growing under the tree canopy typically include Rocky Mountain juniper, green ash (*Fraxinus pennsylvanica*), and choke cherry (*Prunus virginiana*), which together generally provide from 5-15% cover. Shrubs growing adjacent to tree stands and up draw heads include snowberry (*Symphoricarpos occidentalis*) and ill-scented sumac (*Rhus trilobata*). Littleseed ricegrass (*Oryzopsis hymenoides*) is the common understory herb but does not usually exceed 5% cover.

Globally
This woodland community is dominated by small *Juniperus scopulorum* trees through most of its range, and is replaced by *J. virginiana* and introgressant hybrids in the eastern portion of its range in Nebraska and South Dakota (Kaul *et al.* 1983, Von Loh et al. 1999). Some stands contain *Fraxinus pennsylvanica*. Most of these trees are 10-20 cm dbh and 4-6 meters tall (Nelson 1961, Hansen *et al.* 1984). Some trees can be up to 30-40 cm dbh. The basal area has been reported at 22-29 m2/ha in North Dakota (Hansen *et al.* 1984) and up to 22-41 m2/ha in southeastern Montana and northwestern South Dakota (Hansen and Hoffman 1988). Tree canopy is moderate to dense. In North Dakota, Girard *et al.* (1989) measured densities of 975 trees/ha. Where the canopy is dense the shrub and herbaceous strata are poorly developed. Where the canopy is less full, shrubs and herbaceous species are more abundant. On 7 stands in southwest North Dakota mosses and lichens covered 72% of the ground surface, shrubs covered 17.4%; graminoids - 69.1%; forbs - 9.4% (Hansen *et al.* 1984). Three stands in southeastern Montana had less coverage in each strata (Hansen and Hoffman 1988). Among the shrubs that may be found in this community are *Juniperus communis*, *J. horizontalis*, small *J. scopulorum or J. virginiana*, *Mahonia repens*, *Pentaphylloides floribunda*, *Prunus virginiana, Rhus trilobata, Ribes aureum, R. cereum, Rosa woodsii*, *Symphoricarpos albus*, and *S. occidentalis*. Typical herbaceous species include *Anemone patens, Antennaria microphylla, Campanula rotundifolia*, *Carex inops* ssp. *heliophila*, *Chenopodium fremontii*, *Elymus lanceolatus, E. trachycaulus, Galium boreale*, *Geum triflorum, Koeleria macrantha*, *Oryzopsis micrantha*, *Maianthemum stellatum, Parietaria pensylvanica*, and *Taraxacum officinale*. *Acer negundo* and *Fraxinus pennsylvanica* saplings are sometimes found in depressions where soil and moisture accumulate.

CONSERVATION RANK G3. A number of sites have been impacted by cutting for fenceposts or railroad ties. Fire suppression may increase the extent of the community within its range.

DATABASE CODE CEGL000747

MAP UNITS Rocky Mountain juniper / little-seed ricegrass stands are mapped under map class 44 (Rocky Mountain juniper / Little-seed ricegrass Woodland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS
Badlands National Park
This type grades into green ash - American elm woodlands as the slope lessens and/or more mesic conditions are present in the draw. The type also grades into ponderosa pine (*Pinus ponderosa*) trees in the steepest draws of the southernmost South Unit. Where Rocky Mountain Juniper and ponderosa pine are co-dominant in the canopy, stands can be difficult to map, falling between class 43 and 44. Many stands were assessed while preparing the Badlands NP vegetation map.

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Pinus ponderosa / Juniperus scopulorum Woodland

COMMON NAME	Ponderosa Pine / Rocky Mountain Juniper Woodland
SYNONYM	Ponderosa Pine / Rocky Mountain Juniper Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a)
ALLIANCE	PINUS PONDEROSA WOODLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Ponderosa pine / Rocky Mountain juniper Woodlands are a rare type in Badlands NP, becoming more common to the south. In Badlands NP, this community occupies the rims of some tables and buttes, i.e., both Cedar Buttes and Red Shirt Table, and the heads of some draws in the Palmer Creek subunit.

Globally

The range of this community includes southeastern Montana, eastern Wyoming, southwestern North Dakota, western South Dakota, western Nebraska, and possibly northeastern Colorado. A community of this name has been reported in New Mexico but its present status and similarity to this community is uncertain. In southwestern North Dakota this type is restricted to near the Little Missouri River and its tributaries (Girard *et al.* 1989).

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Ponderosa pine / Rocky Mountain juniper woodlands occupy the heads of steep draws, and steep slopes of table and butte rims. There is little relationship to aspect, as long as habitat for successful seedling establishment is present.

Globally

This community has been found primarily on slopes between 16-45 percent with a variety of aspects. In the central and southern portions of its range, it is predominantly on dry-mesic north- or east-facing slopes. In more mesic local climates or with heavier soils this community can exist on south-facing slopes. In North Dakota, Girard *et al.* (1989) found *Pinus ponderosa* stands on level to gently sloping (0-15 percent) mostly south-facing slopes. Throughout its range, the type can be found on bedrock of sandstone, limestone, or shale. Soils are usually well-drained, shallow, very stony, clay loams, silt loams, and sandy loams.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Tree	*Juniperus virginiana*, *Juniperus scopulorum*, *Pinus ponderosa*
Shrub	*Rhus trilobata*, *Prunus virginiana*, *Pinus ponderosa*, *Juniperus virginiana*, *Juniperus scopulorum*
Herbaceous	*Thermopsis rhombifolia*, *Bouteloua curtipendula*, *Schizachyrium scoparium*

Globally

Stratum	Species
Tree Canopy	*Pinus ponderosa*
Tree sub-canopy	*Juniperus scopulorum*

CHARACTERISTIC SPECIES

Badlands National Park

Pinus ponderosa, *Juniperus scopulorum (Juniperus virginiana)*, *Schizachyrium scoparium*, *Bouteloua curtipendula*

Globally

Juniperus scopulorum, Pinus ponderosa, Schizachyrium scoparium

OTHER NOTABLE SPECIES

Badlands National Park

Globally

Stratum	Species
Short Shrub	*Cercocarpus montanus, Rhus trilobata*
Graminoid	*Bouteloua gracilis, Schizachyrium scoparium*

VEGETATION DESCRIPTION

Badlands National Park

Stands of ponderosa pine/Rocky Mountain juniper woodland typically have a relatively open canopy along butte and table tops, but are quite closed within draws. Ponderosa pine (*Pinus ponderosa*) forms an open canopy ranging from 10-40% cover, with a subcanopy occasionally present. Canopy cover for Rocky Mountain juniper (*Juniperus scopulorum*) generally ranges from 10-30% when growing in ponderosa pine stands. Shrub cover is sparse, usually less than 15%, with ill-scented sumac (*Rhus trilobata*), western snowberry (*Symphoricarpos occidentalis*), choke cherry (*Prunus virginiana*), and poison ivy (*Toxicodendron rydbergii*) the common species. Herbaceous cover typically ranges from 20-40%, depending on the size of canopy openings. Little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*) are common graminoids in the herbaceous layer.

Globally

This community has a dense to moderately open canopy of *Pinus ponderosa* that is typically 10-20 m high. Most of the trees in the canopy are 20-40 cm dbh (Hoffman and Alexander 1987). *Juniperus scopulorum* forms a subcanopy that is 2-4 m high and is also moderately dense to open. There is usually a shrub layer that contains *Cercocarpus montanus, Rhus trilobata, Symphoricarpos occidentalis*, and *Yucca glauca*. The herbaceous layer is sparse or absent, especially under areas of dense canopy or on very steep, eroding slopes. Total vegetation cover averaged 33 percent in seven stands in southeastern Montana (Brown 1971). Litter can accumulate to a depth of 10 cm or more where conifers are dense (Thilenius *et al.* 1995). Where the herbaceous stratum is present it is dominated by prairie graminoids. These include *Bouteloua curtipendula, B. gracilis, Carex filifolia, Pseudoroegneria spicata*, and *Schizachyrium scoparium*.

CONSERVATION RANK G4. Type is fairly widespread across 4 states, though it is not known to be very extensive in any of its range. Protection status across the range of this type is not known.

DATABASE CODE CEGL000861

MAP UNITS The Ponderosa pine/Rocky Mountain juniper woodland community is mapped as map class 43 (Ponderosa pine/Rocky Mountain juniper Woodland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

Juniperus scopulorum / Oryzopsis micrantha Woodland (Stands dominated by both *Pinus ponderosa* and *Juniperus scopulorum*, but with less than 25% *Pinus ponderosa*, are placed in this type.)

Juniperus scopulorum Woodland (is very similar, but the density of *Juniperus scopulorum* is high.)

COMMENTS

Badlands National Park

The Ponderosa Pine / Rocky Mountain Juniper/ type often occupies heads of draws, and it quickly intergrades with the Rocky Mountain Juniper / Littleseed Ricegrass Woodland a short distance down the draw. It is difficult to separate these woodland types on aerial photography and it may be necessary to map them together to meet accuracy requirements. Ponderosa pine seedlings and saplings were observed invading adjacent little bluestem - sideoats grama grasslands. A few stands were visited during preparation of the vegetation map.

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Eleagnus angustifolia Semi-natural Woodland

COMMON NAME	Russian Olive Semi-natural Woodland
SYNONYM	Russian Olive Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.B.2.N)
FORMATION	Cold-deciduous woodland (II.B.2.N.a)
ALLIANCE	ELAEAGNUS ANGUSTIFOLIA SEMI-NATURAL WOODLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Only one stand of Russian olive woodland was observed, along the White River in the South Unit, near the Visitor Center.

Globally

The type is currently reported from western South Dakota, in Badlands National Park, but it is undoubtedly more widespread.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

The Russian olive woodland occupies a portion of shoreline along the White River, upstream of a highway bridge.

Globally

In Badlands National Park, this type occupies a portion of shoreline along the White River, upstream of a highway bridge.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Tree	*Elaeagnus angustifolia*
Shrub	*Amorpha fruticosa*, *Salix exigua*
Herbaceous	*Pascopyrum smithii*

Globally

Stratum	Species
Tree Canopy	*Elaeagnus angustifolia*
Shrub	*Amorpha fruticosa, Salix exigua*
Graminoid	*Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Elaeagnus angustifolia, *Salix exigua*, *Pascopyrum smithii*

Globally

Elaeagnus angustifolia, Pascopyrum smithii, Salix exigua

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

The Russian olive semi-natural woodland occupies a portion of the riparian zone along the White River. Russian olive (*Eleagnus angustifolia*) dominates the stand. Canopy closure approaches 40-50%, about equal to the tall shrub cover provided by sandbar willow (*Salix exigua*). Lead plant (*Amorpha fruticosa*) and western wheatgrass (*Pascopyrum smithii*) make up the short shrub and herbaceous cover, which are less than 10%.

Globally

In Badlands National Park of South Dakota, the Russian olive semi-natural woodland occupies a portion of the riparian zone along the White River. *Elaeagnus angustifolia* dominates the stand. Canopy closure approaches 40-50%, about equal to the tall shrub cover provided by *Salix exigua*. *Amorpha fruticosa* and *Pascopyrum smithii* make up the short shrub and herbaceous cover, which are less than 10%.

CONSERVATION RANK GW.

DATABASE CODE CEGL005269

MAP UNITS The Russian olive woodland is mapped under map class 41, Eastern cottonwood - (Peachleaf willow) / Sandbar

willow woodland.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

Russian olive is becoming established along rivers and perennial streams within Badlands NP and the region. This exotic tree is probably being spread by birds that carry the seeds from landscape plantings and windbreaks in agricultural areas. Only one large stand was observed along the White River and it is represented by plot data.

Globally

Elaeagnus angustifolia is often planted for windbreaks and ornamental purposes, and is now firmly established in the Great Plains. It thrives on dry to moist soils of all types, especially on sandy floodplains (Great Plains Flora Association 1986). It is becoming established along rivers and perennial streams within Badlands National Park, South Dakota, and the region. This exotic tree is probably being spread by birds that carry seeds from landscape plantings and windbreaks in agricultural areas (Von Loh *et al.* 1999).

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Fraxinus pennsylvanica - Ulmus americana / Prunus virginiana Woodland

COMMON NAME	Green Ash - American Elm / Choke Cherry Woodland
SYNONYM	Green Ash - Elm Woody Draw
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.B.2.N)
FORMATION	Cold-deciduous woodland (II.B.2.N.a)
ALLIANCE	FRAXINUS PENNSYLVANICA - (ULMUS AMERICANA) WOODLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Green ash - American elm woodlands are distributed throughout Badlands NP, occupying mesic draws, small drainages, and the outer edge of river floodplains. A more specialized habitat supporting this type is the interface between the base of sandhills and clay soils, where seeps and springs emerge.

Globally

This community is reported from Montana, North Dakota, and South Dakota; it is found in four sections of two ecoregion provinces.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Green ash - American elm woodlands are found in less-steep, mesic draws, small perennial drainages, base of sandhills, and edge of floodplains within the park.

Globally

In western South Dakota and North Dakota, this community occurs in upland ravines and broad valleys or on moderately steep slopes. It also occurs along small permanent or ephemeral streams. In central North Dakota, this community is also found along the north slopes of end moraines or kames and along lakeshores (Williams 1979 and Godfread 1976). On these sites, soil and topography permit greater than normal moisture conditions. In south-central South Dakota this community occurs on steep, north-facing escarpments and around boulder outcrops. In the western Dakotas soils are clay loams, sandy clay loam, silty clay, and sandy loam. Soil pH ranges from 6.3 to 7.5 in South Dakota, while soils in North Dakota have pH of 6.0-8.1. Slopes range from 0 to 40 percent. In south-central South Dakota soils are dry to moist, and moderately drained (Hansen and Hoffman 1988, Girard *et al.* 1989).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Tree	*Populus deltoides*, *Juniperus scopulorum*, *Ulmus americana*, *Fraxinus pennsylvanica*
Shrub	*Toxicodendron rydbergii*, *Rosa arkansana*, *Ribes odoratum*, *Prunus virginiana*, *Rhus trilobata*
Herbaceous	*Maianthemum stellatum*, *Pascopyrum smithii*, *Andropogon gerardii*, *Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Fraxinus pennsylvanica*
Tall shrub	*Prunus virginiana*
Graminoid	*Carex sprengelii*

CHARACTERISTIC SPECIES

Badlands National Park

Fraxinus pennsylvanica, *Ulmus americana*, *Juniperus scopulorum*, *Prunus virginiana*, *Rhus trilobata*, *Pascopyrum smithii*, *Poa pratensis*, *Andropogon gerardii*

Globally

Fraxinus pennsylvanica, Prunus virginiana

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Tree canopy	*Ulmus americana*
Tall shrub	*Prunus americana*
Shrub	*Amelanchier alnifolia, Amelanchier sanguinea, Elaeagnus angustifolia, Rosa woodsii, Shepherdia*

	argentea, Symphoricarpos occidentalis, Zanthoxylum americanum
Forb	*Anemone canadensis, Anemone cylindrica, Galium boreale, Lactuca tatarica var pulchella, Nepeta cataria, Parietaria pensylvanica, Polygonatum biflorum, Thalictrum dasycarpum, Thalictrum venulosum*
Graminoid	*Bromus inermis, Elymus canadensis, Elymus caninus, Muhlenbergia racemosa, Pascopyrum smithii, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Stands of green ash - American elm woodland have a tightly closed canopy ranging from 75-100% closure, dominated by green ash (*Fraxinus pennsylvanica*), with some American elm (*Ulmus americana*). A subcanopy of seedling/sapling green ash and American elm is usually present, and when the site includes a spring or seep, a few cottonwood (*Populus deltoides*) and peachleaf willow (*Salix amygdaloides*) trees often become established. Shrub cover is relatively sparse, ranging from 10-25%, with ill-scented sumac (*Rhus trilobata*), choke cherry (*Prunus virginiana*), western snowberry (*Symphoricarpos occidentalis*), and poison ivy (*Toxicodendron rydbergii*) common. Often, a very dense shrub community becomes established along the edges of the draw and in the head of the draw, above the deciduous trees. Herbaceous species generally contribute less than 10% of the ground cover and include western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*Poa pratensis*), and big bluestem (*Andropogon gerardii*).

Globally

This community is an open to closed canopy woodland dominated by *Fraxinus pennsylvanica. Ulmus americana* sometimes achieves codominance. The largest trees are 50 to 60 cm dbh, but most trees are 20 to 30 cm dbh. In sharply cut, V-shaped upland ravines, the largest trees are near the center or bottom of the ravine where there is greater soil moisture. The average tree age is 70 to 80 years. In undisturbed stands, the understory is composed of two layers. The taller and more conspicuous layer is a shrub layer 2 to 3 m tall. This layer is dominated by *Prunus virginiana* with smaller amounts of *Symphoricarpos occidentalis*. The lower layer is dominated by grasses and sedges such as *Elymus virginicus* and *Carex sprengelii*. Common herbaceous species include *Galium boreale, G. aparine*, and *Maianthemum stellatum*. In central South Dakota this community is a woodland with an open canopy of ash trees and an extremely dense shrubby understory. The average tree height is 6.7 m and the shrub understory is 1.6 m high. There are few herbaceous species (U.S. Army Corp of Engineers 1979). The continuation of the status of *Ulmus americana* as a prominent part of this community is uncertain due to the effects of Dutch Elm disease (Hansen *et al.* 1984, Hansen and Hoffman 1988, Girard *et al.* 1989, Hansen *et al.* 1990).

CONSERVATION RANK G2G3. There are probably fewer than 100 occurrences of this community rangewide. It is reported from Montana (where it is ranked S1Q), North Dakota (SU), and South Dakota (SU). Currently 41 occurrences are documented from North Dakota. Historical acreage and trends are unknown.

DATABASE CODE CEGL000643

MAP UNITS The green ash - American elm woodland type is mapped under map class 42 (Green ash - (American elm) / Choke cherry Woodland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

Acer negundo / Prunus virginiana Forest (may represent a disturbed variant of this type)

Fraxinus pennsylvanica - Ulmus americana / Symphoricarpos occidentalis Forest (may resemble stands which are overgrazed (Girard *et al.* 1989).)

Fraxinus pennsylvanica / Prunus virginiana Forest

COMMENTS

Badlands National Park

The green ash - American elm woodland type grades into Rocky Mountain juniper/littleseed ricegrass woodland in drier portions of draws and grades into American plum, ill-scented sumac, and western snowberry shrublands at draw sides and heads. In drainages and along floodplains, it can be difficult to separate this type from cottonwood - peachleaf willow woodland stands. This type is well-represented in sampling efforts conducted at Badlands NP.

Globally

In Theodore Roosevelt National Park, cattle grazing was common in these stands, as is true elsewhere in the range of this type. In Theodore Roosevelt National Park, bison utilize this habitat for grazing, watering, and summer-time shade (Hansen *et al.* 1984). Past heavy grazing by cattle is reflected in the dominance of some weedy species, such as *Melilotus officinalis, Melilotus alba,* and *Poa pratensis* (Hansen *et al.* 1984).

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Populus deltoides - (Salix amygdaloides) / Salix exigua Woodland

COMMON NAME	Eastern Cottonwood - (Peachleaf Willow) / Sandbar Willow Woodland
SYNONYM	Cottonwood - Peach-Leaf Willow Floodplain Woodland
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.B.2.N)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b)
ALLIANCE	POPULUS DELTOIDES TEMPORARILY FLOODED WOODLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Cottonwood - willow woodlands are distributed in the floodplains of the White and Cheyenne Rivers, smaller creeks and drainages, and around ponds and reservoirs throughout Badlands NP.

Globally

This community is found in southern Manitoba, North Dakota, South Dakota, central and western Nebraska, western Kansas, eastern Colorado, and Oklahoma. It may occur in Texas and New Mexico.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Cottonwood - willow woodlands occupy river and creek floodplains, pond and reservoir margins, seeps and springs in mesic draws, and seeps and springs that occur along the edge of sandhill complexes.

Globally

This community is found along the banks of streams and rivers, usually within 100 feet of the stream channel. It develops on newly deposited alluvium. The soils are predominantly sand, although silt, clay, or loam may be present. Soils are poorly developed. The water table fluctuates with the level of the river or stream and flooding is common, especially in the spring. In Wyoming, height above the stream channel varies from 1.5 to 10 feet (Jones and Walford 1995).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Tree	*Fraxinus pennsylvanica*, *Juniperus virginiana*, *Salix amygdaloides*, *Populus deltoides*
Shrub	*Rhus trilobata*, *Shepherdia argentea*, *Symphoricarpos occidentalis*
Herbaceous	*Nassella viridula*, *Poa pratensis*, *Pascopyrum smithii*

Globally

Stratum	Species
Tree canopy	*Populus deltoides, Salix amygdaloides*
Short shrub	*Salix exigua, Symphoricarpos occidentalis*
Forb	*Ambrosia psilostachya, Glycyrrhiza lepidota, Helianthus petiolaris*
Fern	*Equisetum arvense*
Graminoid	*Carex emoryi, Carex lanuginosa, Pascopyrum smithii, Poa pratensis, Spartina pectinata, Sporobolus cryptandrus*

CHARACTERISTIC SPECIES

Badlands National Park

Populus deltoides, *Salix amygdaloides*, *Symphoricarpos occidentalis*, *Pascopyrum smithii*, *Poa pratensis*

Globally

Populus deltoides, Salix amygdaloides, Salix exigua

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Forb	*Cirsium arvense, Euphorbia esula, Taraxacum officinale*
Graminoid	*Bromus tectorum, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Stands of cottonwood - peachleaf willow woodland have a range of canopy closure, depending on stand age and landscape position. Those stands sampled ranged from 25-75% cover for trees and understory grasses, but shrubs generally contributed less than 5% cover. Cottonwood (*Populus deltoides*) is the dominant tree, with peachleaf willow (*Salix amygdaloides*) a frequent associate. Older trees are generally further out on the floodplain, and tend to have large canopy openings. Older stands also tend to be invaded by other tree species including green ash (*Fraxinus pennsylvanica*) and eastern red cedar (*Juniperus virginiana*). Western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*Poa pratensis*), and green needlegrass (*Nassella viridula*) are the common herbaceous species, and western snowberry (*Symphoricarpos occidentalis*) is the most common shrub species present.

Globally

This community has an open canopy 6-12 m tall and typically dominated by *Populus deltoides* and *Salix amygdaloides*, though *Salix amygdaloides* can be absent in some examples of this community. *Fraxinus pennsylvanica* may be present, especially on the upland side of this community, and *Elaeagnus angustifolia* or *Juniperus* spp. may invade some sites. This woodland community has closely spaced shrubs and small trees. *Salix exigua* is usually more abundant along the streamside margins of this community and where the canopy of taller trees is most open, which may occur following a scouring (heavy flood) event. This shrub grows to 2-5 m tall. Other shorter shrubs that can be found are *Symphoricarpos occidentalis* and *Toxicodendron rydbergii*. Graminoids adapted to mesic sites dominate the understory of most sites, the most common species including *Carex emoryi, C. pellita, Elymus canadensis, Hordeum jubatum, Muhlenbergia racemosa, Pascopyrum smithii, Poa pratensis*, and *Spartina pectinata*. Forbs that are frequently abundant in relatively undisturbed sites include *Equisetum arvense* and *Glycyrrhiza lepidota*. Flooding often creates open patches in the herbaceous layer that are available for colonization by nearby species. The floristic composition of these patches is greatly affected by the species that are near and can invade the disturbed areas. Because of the high permeability of the sandy floodplain soils, species typical of upland prairie may invade in addition to annual forbs typical of disturbed sites. Widely distributed species that are adapted to these sites include *Ambrosia psilostachya, Artemisia campestris* ssp. *caudata, A. ludoviciana, Calamovilfa longifolia, Cenchrus longispinus, Euphorbia serpyllifolia, E. esula, Grindelia squarrosa, Helianthus petiolaris, Heterotheca villosa, Lippia lanceolata, Opuntia macrorhiza, Poa pratensis*, and *Sporobolus cryptandrus*. These sites are prone to invasion by exotic grasses and forbs, the most widely established being *Agrostis stolonifera, Bromus tectorum, Cirsium arvense, Kochia scoparia, Melilotus* spp., *Taraxacum officinale*, and *Tragopogon dubius*.

CONSERVATION RANK G3G4. In the absence of regular flooding, many sites will undergo succession to later seral stages. Many sites are overgrazed and invaded by exotic woody and herbaceous species.

DATABASE CODE CEGL000659

MAP UNITS The cottonwood - peachleaf willow woodland type is mapped under map class 41 (Eastern cottonwood - (Peachleaf willow) / Sandbar willow Woodland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

Populus deltoides / Panicum virgatum - Schizachyrium scoparium Woodland (may be a subtype of this community whose character is maintained by winter grazing.)

COMMENTS

Badlands National Park

Little riparian woodland of any type is present within Badlands NP; stands are restricted to drainages, ponds and reservoirs. The cottonwood - peachleaf willow type was interpreted wherever a stand occurred, often below the minimum mapping unit of 0.5 hectares, because of its importance as a habitat. In order to better understand this woodland in the region, sampling was conducted off-park on both the Cheyenne and White Rivers. A good representation of this woodland type has been obtained following field sampling efforts.

Globally

Populus deltoides/ Panicum virgatum - Schizachyrium scoparium Woodland (CEGL001454) may be a subtype of this community whose character is maintained by winter grazing. Flooding and scouring by sand and ice are common in most examples of this community. During floods, erosion and deposition of material may occur. Drought stress affects shallow-rooted plants when the water table drops. This community is a seral community and requires the creation of new sandbars, mudflats, and other barren stretches for its continued existence. Bellah and Hulbert (1974) found that this community existed for only about 20 years before succession altered the forest to another community. Johnson (1994) believed that alteration of the hydrology of the Platte River in Nebraska has reduced the frequency of flooding. Thus, early successional communities such as this one were not being reestablished as quickly as they were being replaced by later seral communities. This type is subject to, and maintained by, periodic flooding. Thirty years post-flood, this type will likely transition into a grassland type, as the cottonwood and willow species do not regenerate (Bellah and Hulbert 1974).

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Artemisia filifolia / Calamovilfa longifolia Shrubland

COMMON NAME	Sand Sagebrush / Prairie Sandreed Shrubland
SYNONYM	Sand Sage / Prairie Sandreed Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.4.N)
FORMATION	Microphyllous evergreen shrubland (III.A.4.N.a)
ALLIANCE	ARTEMISIA FILIFOLIA SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Sand sagebrush shrublands occupy sand hills and high sand ridges, which are mostly distributed on Red Shirt and Blind Man Tables in the park's South Unit. A small amount of sand hills habitat lies within park boundaries southeast of Sheep Mountain Table and on the eastern edge of the Palmer Creek Unit.

Globally

This type is only reported from western South Dakota, where it is found in sandy habitats in Badlands National Park on Red Shirt and Blind Man Tables in the park's South Unit. A small amount of sand hills habitat lies within park boundaries southeast of Sheep Mountain Table and on the eastern edge of the Palmer Creek Unit (Von Loh *et al.* 1999).

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Sand sagebrush shrublands are confined to the highest sand hills and ridges; this type forms a mosaic with yucca shrub grasslands on some lower sand ridges and where sand hills/ridges adjoin butte tops.

Globally

Sand sagebrush shrublands are confined to the highest sand hills and ridges; this type forms a mosaic with yucca shrub grasslands (*Yucca glauca*) on some lower sand ridges and where sand hills/ridges adjoin butte tops (Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Opuntia polyacantha*, *Yucca glauca*, *Artemisia filifolia*
Herbaceous	*Bromus tectorum*, *Carex filifolia*, *Bouteloua gracilis*, *Calamovilfa longifolia*

Globally

Stratum	Species
Short Shrub	*Artemisia filifolia, Opuntia polyacantha, Yucca glauca*
Graminoid	*Bouteloua gracilis, Bromus tectorum, Calamovilfa longifolia, Carex filifolia*

CHARACTERISTIC SPECIES

Badlands National Park

Artemisia filifolia, *Yucca glauca*, *Opuntia polyacantha*, *Calamovilfa longifolia*, *Andropogon hallii*, *Bouteloua gracilis*, *Carex filifolia*, *Sporobolus cryptandrus*

Globally

Andropogon hallii, Artemisia filifolia, Bouteloua gracilis, Calamovilfa longifolia, Carex filifolia, Opuntia polyacantha, Sporobolus cryptandrus, Yucca glauca

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Schizachyrium scoparium*

VEGETATION DESCRIPTION

Badlands National Park

Sand sagebrush communities within Badlands NP have sparse to moderate cover, between 15-50%. Higher sand hills also have a large proportion of bare sand to vegetation between individual shrubs. The only shrub that becomes co-dominant with sand sagebrush (*Artemisia filifolia*) is yucca (*Yucca glauca*), and it typically occurs on lower sand ridges and places where sand hills interface with nearly flat butte tops. Herbaceous cover is sparse to moderate, typically consisting of blue grama (*Bouteloua gracilis*), prairie sandreed (*Calamovilfa longifolia*), sand dropseed (*Sporobolus cryptandrus*), threadleaf sedge (*Carex filifolia*),

and sand bluestem (*Andropogon hallii*).

Globally
Sand sagebrush communities within Badlands National Park have sparse to moderate cover, between 15-50%. Higher sand hills also have a large proportion of bare sand to vegetation between individual shrubs. The only shrub that becomes co-dominant with *Artemisia filifolia* is *Yucca glauca*, and it typically occurs on lower sand ridges and places where sand hills interface with nearly flat butte tops. Herbaceous cover is sparse to moderate, typically consisting of *Bouteloua gracilis*, *Calamovilfa longifolia, Sporobolus cryptandrus, Carex filifolia*, and *Andropogon hallii*. Some stands may contain *Schizachyrium scoparium* (Von Loh *et al.* 1999).

CONSERVATION RANK G?.

DATABASE CODE CEGL002177

MAP UNITS Sand sagebrush shrublands are mapped under map class 32 (Sand sagebrush / Prairie sandreed Shrubland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS
Artemisia filifolia / *Andropogon hallii* Shrubland (*Andropogon hallii* occurs only rarely in 2177, but the habitat is similar. Types could well be combined upon range-wide review.)
Yucca glauca / Calamovilfa longifolia Shrub Herbaceous Vegetation

COMMENTS
Badlands National Park
Stands of the sand sagebrush shrublands have been classified as the *Artemisia filifolia / Calamovilfa longifolia* Shrubland type (CEGL002177). However, this type may overlap in concept with the *Artemisia filifolia / Andropogon hallii* Shrubland type (CEGL001459) reported from Nebraska, Wyoming and southward. Further range-wide review is necessary.

The sand sagebrush shrubland is confined to sandhills of the Valentine association, and to a lesser extent, sand ridges of the Anselmo association. It is on these sand ridges where sand sagebrush may form a mosaic with yucca shrub grasslands. Several stands were visited during field inventory work and they appeared quite consistent in vegetation structure and composition.

Globally
The sand sagebrush shrubland is confined to sandhills of the Valentine association, and to a lesser extent, sand ridges of the Anselmo association. It is on these sand ridges where *Artemisia filifolia* (sand sagebrush) may form a mosaic with *Yucca glauca* shrub grasslands, such as *Yucca glauca / Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675) (Von Loh *et al.* 1999).

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Chrysothamnus nauseosus / Pseudoroegneria spicata Shrubland

COMMON NAME	Rubber Rabbitbrush / Bluebunch Wheatgrass Shrubland
SYNONYM	Common Rabbitbrush/Bluebunch Wheatgrass Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.4.N)
FORMATION	Microphyllous evergreen shrubland (III.A.4.N.a)
ALLIANCE	CHRYSOTHAMNUS NAUSEOSUS SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Rabbitbrush shrublands are rare within Badlands NP and are most easily observed where they are colonizing roadsides or other recently disturbed habitats. Small stands occur along the main park road in the North Unit and along Cuny Table Road and Red Shirt Road in the South Unit. The largest stand of rabbitbrush occurring in a non-human created habitat was observed in a small drainage near Plenty Star Table in the park's South Unit.

Globally

This Common Rabbitbrush shrubland type may occur across the northern Great Plains.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Rabbitbrush shrublands occur on nearly level to steep sites on road cuts and fill areas, and along moderately steep drainages. Dwarf rabbitbrush shrubs are also a component of Badlands Sparse Vegetation Complex types, described under other sections of this report.

Globally

As described from the Dakotas, stands occur either on dry, steep slopes along roadcuts or in heavily grazed floodplains.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Gutierrezia sarothrae*, *Chrysothamnus nauseosus*
Herbaceous	*Bromus tectorum*, *Bromus japonicus*, *Artemisia dracunculus*, *Pascopyrum smithii*

Globally

Stratum	Species
Short Shrub	*Chrysothamnus nauseosus*

CHARACTERISTIC SPECIES

Badlands National Park

Chrysothamnus nauseosus, *Pascopyrum smithii*, *Bromus japonicus*

Globally

Chrysothamnus nauseosus, Pseudoroegneria spicata

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Pascopyrum smithii, Pseudoroegneria spicata*

VEGETATION DESCRIPTION

Badlands National Park

Rabbitbrush shrublands at Badlands NP are small and have moderate to dense shrub cover, from 30-65%. Rabbitbrush (*Chrysothamnus nauseosus*) occurs as a nearly monotypic stand, with few other shrubs present. The herbaceous cover is quite dense, dominated by either the native perennial western wheatgrass (*Pascopyrum smithii*) or the exotic annuals Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*).

Globally

In the Dakotas, the vegetation has an open structure, with clumps of shrubs around 0.5 to 1 m tall scattered over a medium-tall herbaceous layer. *Chrysothamnus nauseosus* is the dominant shrub. Other less common shrubs include *Prunus virginiana* and *Symphoricarpos occidentalis*. The herbaceous layer may contain the graminoids *Elymus trachycaulus ssp. trachycaulus* and *Pascopyrum smithii*. Forbs include *Melilotus officinalis*. Stands may contain a variety of other weedy species, such as *Bromus*

japonicus and *Bromus tectorum* (Von Loh *et al.* 1999). Further west, in Montana, the type may occur in entirely natural habitats, and the dominant graminoid is *Pseudoroegneria spicata*.

CONSERVATION RANK G3Q. Type may be weedy (semi-natural) as well as natural, making ranking difficult.

DATABASE CODE CEGL001330

MAP UNITS The rabbitbrush shrubland type is represented by map class 33 (Rabbitbrush Shrubland), on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

Although stands of rabbitbrush shrubland are classified as the *Chrysothamnus nauseosus / Pseudoroegneria spicata* Shrubland (CEGL001330), a type reported from Montana, they do not appear to fit that type concept very well, as no bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs in this type. Because stands at Badlands NP are rather weedy, it may be difficult to define characteristic species. The global type has not been well described globally, so further review is still needed.

Rabbitbrush shrublands along natural drainages intergrade with silver sagebrush and are difficult to classify. This is a rare type at Badlands NP, but it is relatively well-sampled given this rarity.

Globally

Chrysothamneus nauseosus increases in abundance in heavily grazed floodplain stands of cottonwood (Thilenius *et al.* 1995). Stands in Montana contain *Pseudoroegneria spicata*. It's possible that the weedy stands in South Dakota should not be assigned to this type.

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Artemisia cana / Pascopyrum smithii Shrubland

COMMON NAME	Coaltown Sagebrush / Western Wheatgrass Shrubland
SYNONYM	Silver Sagebrush / Western Wheatgrass Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.A.4.N)
FORMATION	Temporarily flooded microphyllous shrubland (III.A.4.N.c)
ALLIANCE	ARTEMISIA CANA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Silver Sagebrush / Western Wheatgrass Shrublands are widely distributed within Badlands NP, but are mostly confined to drainage bottoms, where they occupy sediment deposits between meanders.

Globally

This community is found in western North and South Dakota, eastern Montana, and is rare in Nebraska.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Silver sagebrush shrublands occur most commonly on level sites between the meanders of minor drainages, creeks, and rivers. Sometimes this shrubland also occurs on gentle to moderate hillslopes and along the edges of broad drainages. The dominant shrub, silver sagebrush, is a minor component of several other shrub communities throughout the park. Western wheatgrass is a graminoid that is dominant throughout the park.

Globally

This community occurs on flat alluvial deposits on floodplains, terraces or benches, or alluvial fans. The soils are moderately deep to deep (USFS 1992) and either silt loam, clay loam, or sandy loam (Johnston 1987, Hansen and Hoffman 1988). The soils may have moderate salt content (Hanson and Whitman 1938). Flooding occurs periodically and this tends to retard soil profile development (Hirsch 1985).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Artemisia cana*
Herbaceous	*Bromus japonicus*, *Bouteloua gracilis*, *Pascopyrum smithii*

Globally

Stratum	Species
Short Shrub	*Artemisia cana*
Graminoid	*Bouteloua gracilis*, *Nassella viridula*, *Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Artemisia cana, *Pascopyrum smithii*, *Bouteloua gracilis*

Globally

Artemisia cana, Nassella viridula, Pascopyrum smithii

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Short Shrub	*Gutierrezia sarothrae, Symphoricarpos occidentalis*
Graminoid	*Koeleria macrantha, Poa pratensis, Stipa comata*

VEGETATION DESCRIPTION

Badlands National Park

Silver sagebrush shrublands at Badlands NP typically have sparse to moderate cover, the values ranging from 15-50%. The shrub cover of silver sagebrush (*Artemisia cana*) is variable, but typically is between 10 and 25%. Recently flooded sites have a large amount of bare ground between individual shrubs, but sites that are relatively undisturbed are well-covered by western wheatgrass (*Pascopyrum smithii*) and blue grama (*Bouteloua gracilis*).

Globally
This community is dominated by a combination of shrubs and graminoids. The total vegetation cover is typically moderate, but depends on frequency of flooding. The USFS (1992) found that on 14 stands in western North Dakota, shrubs averaged 28 percent canopy cover, graminoids 59 percent, and forbs 2 percent. The tallest and most conspicuous stratum is a shrub layer that is usually 0.6-1.2 m, but it may be as short as 0.4 m or as tall as 1.5 m (Hansen and Hoffman 1988). The variation in soils within and between stands of this community results in variable species composition. *Artemisia cana* and *Pascopyrum smithii* are the dominant shrub and graminoid species, respectively. *Symphoricarpos occidentalis* is frequently present. There are also shorter shrubs such as *Artemisia frigida, Krascheninnikovia lanata, Rosa woodsii*, and *Gutierrezia sarothrae*. The most abundant graminoid is *Pascopyrum smithii*. This species is typically 0.5-1.0 m tall. It is often accompanied by *Nassella viridula* and sometimes *Koeleria macrantha, Poa pratensis*, and *Stipa comata. Bouteloua gracilis* is the most abundant short graminoid. Typical forb constituents of this community are *Achillea millefolium, Gaura coccinea, Sphaeralcea coccinea*, and *Lactuca tatarica* var. *pulchella*.

CONSERVATION RANK G4.

DATABASE CODE CEGL001072

MAP UNITS The Silver Sagebrush / Western Wheatgrass Shrubland community is mapped under map class 31 (Silver sagebrush / Western wheatgrass Shrubland) of the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS
Badlands National Park
Silver sagebrush shrubland communities are relatively common within Badlands NP, even though confined largely to drainages. Floristically, it is quite simple, usually with only a few species present in a plot. This community was well-sampled during field research at Badlands NP.

Globally
Periodic flooding occurs in many stands of this community.

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Prunus virginiana - (Prunus americana) Shrubland

COMMON NAME	Choke Cherry - (American Plum) Shrubland
SYNONYM	Choke Cherry - (American Plum) Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a)
ALLIANCE	PRUNUS VIRGINIANA SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

American plum stands, occasionally mixed with chokecherry, occupy mesic draws, typically at the head of green ash or Rocky Mountain juniper woodland types. A few stands are also found at the seep zone on the edge of sandhills, mesic hillslope slumps, and in old river oxbows.

Globally

This community has a wide distribution, being reported from states primarily in the northwestern United States, including the northwestern Great Plains, but also in Nevada.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

American plum stands occupy moderately sloping to nearly level mesic draws and nearly level oxbows. These stands occur at the head of woodland types and are often bordered by western snowberry shrublands.

Globally

In Colorada, this association grows at the interface between the riparian areas and the adjacent upland. Stands usually occur as small pockets on higher terraces or as narrow bands along the high water mark of steep banks and incised channels. It can also grow at the base of cliffs adjacent to rivers and streams where it forms impenetrable thickets (Colorado NHP personal communication 1998). In southwestern South Dakota, stands are found in a variety of habitats. Slope varies from flat to very steep, with variable aspect. Stands are commonly found in the bottoms of draws and drainages. This type also occurs associated with rock outcrops (H. Marriott personal communication 1999, Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Rhus trilobata*, *Ribes odoratum*, *Symphoricarpos occidentalis*, *Prunus virginiana*, *Prunus americana*
Herbaceous	*Nassella viridula*, *Pascopyrum smithii*, *Poa pratensis*

Globally

Stratum	Species
Short Shrub	*Prunus virginiana*

CHARACTERISTIC SPECIES

Badlands National Park

Prunus americana, *Prunus virginiana*, *Symphoricarpos occidentalis*, *Ribes odoratum*, *Poa pratensis*

Globally

Prunus virginiana

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Short Shrub	*Prunus americana, Symphoricarpos occidentalis*
Graminoid	*Pascopyrum smithii, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

American plum shrubland stands are near 100% cover wherever they occur. The stands are very dense and compact in the draws occupied and are dominated by American plum (*Prunus americana*) and choke cherry (*Prunus virginiana*). A variety of other shrubs are always present and western snowberry (*Symphoricarpos occidentalis*) with poison ivy (*Toxicodendron rydbergii*) typically form a border around the taller shrubs. Herbaceous species cover is sparse with Kentucky bluegrass (*Poa pratensis*),

western wheatgrass (*Pascopyrum smithii*), and green needlegrass (*Nassella viridula*) the most common species noted.

Globally
In Colorado, this community type is a medium-height (1.5-2 m) shrubland with dense vegetation that is almost impossible to walk through. (Colorado NHP pers. comm. 1998). In southwestern South Dakota, this type is characterized by moderate to dense shrub cover, typically in the 25-75% range. Shrub cover is generally greater in drainage bottoms and on lowermost slopes, and less on slopes. *Prunus virginiana* may be the dominant shrub species, but often other species are codominant or dominant, especially on slopes, including *Prunus americana, Rhus trilobata, Amorpha canescens, Symphoricarpos occidentalis* and *Toxicodendron pubescens*. In drainage bottom situations, herbaceous cover is usually sparse, less than 10%. On slopes, the shrubs typically occur in some grassland type, and graminoid cover can be greater than 75%.

CONSERVATION RANK G4Q. This type is widespread, but it represents a broadly defined dominance type, with little information on the associated species or habitats that might help define the type more precisely. If, for example, a Great Plains type was separated out from the other types, such a type could be relatively rare.

DATABASE CODE CEGL001108

MAP UNITS The American plum shrubland type is represented by map class 34 (Choke cherry - (American plum) Shrubland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS
Fraxinus pennsylvanica - Ulmus americana / Prunus virginiana Woodland

COMMENTS
Badlands National Park
American plum shrublands grade into western snowberry patches along their margins and into woodland communities lower in the drainage occupied. Many stands were visited during the course of data collection, map verification and accuracy assessment work. They are classified globally as part of the *Prunus virginiana - (Prunus americana)* Shrubland type, as mixtures often occur. However, at Badlands NP, American plum is the typical dominant.

Globally
Stands dominated by *Prunus americana* only occur in the eastern (Great Plains) part of this types range, and they may either form a separate type. Some stands on slopes are the result of recent fire that killed the overlying canopy, converting a *Pinus ponderosa / Prunus virginiana* Forest (CEGL000192) to this *Prunus virginiana* shrubland type.

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Salix exigua Temporarily Flooded Shrubland

COMMON NAME	Narrowleaf Willow Temporarily Flooded Shrubland
SYNONYM	Sandbar Willow Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d)
ALLIANCE	SALIX EXIGUA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Sandbar willow shrubland stands are quite small and rare within Badlands NP. They were observed along the banks of Sage Creek, Fog Creek, White River, and Cheyenne River.

Globally

This community is found along rivers and streams in Oregon, Washington, Idaho, Montana, southern Manitoba, Wyoming, Colorado, Oklahoma, Nebraska, South Dakota, and Iowa. It probably extends into North Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Sandbar willow shrubland stands occur adjacent to creeks and rivers where moist sediments collect, and adjacent to some wetland communities. These sites are nearly level and well-supplied with near-to-surface ground water.

Globally

This community is found on recently deposited or disturbed alluvial material. The parent material is alluvial sand, although silt, clay, or gravel may be present. Soil development is poor to absent.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Fraxinus pennsylvanica*, *Salix exigua*
Herbaceous	*Spartina pectinata*

Globally

Stratum	Species
Shrub	*Salix exigua*

CHARACTERISTIC SPECIES

Badlands National Park

Salix exigua, *Spartina pectinata*

Globally

Salix exigua

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Mature sandbar willow shrublands typically have dense cover, between 60-90%. Sandbar willow is strongly dominant in established stands, but may be relatively sparse along sediment deposits where it is becoming established as seedlings along with cottonwood (*Populus deltoides*).

Globally

This community is dominated by shrubs, generally between 2 and 4 meters tall. The most common of these is *Salix exigua. Salix irrorata* and saplings of *Populus deltoides* or *Salix amygdaloides* are also frequently found in the shrub layer. This stratum can have moderate to high stem density in the community as a whole. The species in the shrub layer do not form a closed canopy, allowing significant light to reach the ground layer. There are often patches where the shrub layer is absent. The herbaceous cover is sparse to moderate. Older stands and places with less competition from the shrubs have greater herbaceous cover. The composition of the herbaceous layer can vary greatly. Species that are often found in this community are *Cenchrus longispinus, Polygonatum lapathifolium, Scirpus americanus, Triglochin maritimum*, and *Xanthium strumarium*.

CONSERVATION RANK G5. This type is widespread and common throughout its range.

DATABASE CODE CEGL001197

MAP UNITS Stands of sandbar willow shrubland rarely meet the minimum mapping unit of 0.5 hectares, but a few were large enough to assign to map class 38 (Sandbar willow Temporarily Flooded Shrubland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS
Salix exigua / Mesic Graminoids Shrubland (These two types may be essentially the same.)

COMMENTS
Badlands National Park
Sandbar willow shrubland stands are small and nearly insignificant in cover value for the park. Only a few stands were visited during the course of the study, particularly along Sage Creek and the White River near the Visitor's Center.

Globally
In Nebraska, Steinauer and Rolfsmeier (1997) report that *Amorpha fruticosa, Cornus sericea*, and *Salix lutea* are also present in the shrub layer. In the herbaceous layer they report the following species: *Ambrosia artemisiifolia* and *Aster lanceolatus.*

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Shepherdia argentea Shrubland [Provisional]

COMMON NAME	Silver Buffalo-berry Shrubland
SYNONYM	Buffaloberry Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d)
ALLIANCE	SHEPHERDIA ARGENTEA TEMPORARILY FLOODED SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The silver buffalo-berry vegetation type is uncommon and occurs in very small patches. Stands are very dense, typically exceeding 100% vegetative cover. Stands are located near the northeastern park boundary along small drainages and along the White River near the White River Visitor Center.

Globally

This community is found in Colorado, Wyoming, Montana, southern Saskatchewan, and possibly North Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Silver buffalo-berry shrublands establish in the riparian zone along the edge of streams and rivers. They appear to establish after species such as cottonwood (*Populus deltoides*) trees have colonized the zone, as well as on the outside margin of cottonwood stands, perhaps because seeds are eaten and distributed by avifauna that roost/nest in these larger trees. Soils are sediments deposited during high flows. The shrubs are excellent bank stabilizers, once established.

Globally

This community is found on stream terraces, rolling uplands, and badlands. It occurs where moisture is more plentiful than on the surrounding landscape, such as in swales, ravines, near streams, and on northwest to east facing slopes (Hansen and Hoffman 1988, DeVelice *et al.* 1995). This trend is more pronounced in Wyoming where Jones and Walford (1995) only found this community near streams and may be less pronounced in Saskatchewan and northern Montana. Soils are loamy sand, sandy loam, silty loam, or loam and are derived from glacial drift, siltstone, or sandstone (USFS 1992, DeVelice *et al.* 1995). This community does not flood often, but some sites show evidence of a high water table (DeVelice *et al.* 1995).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Ribes odoratum*, *Toxicodendron rydbergii*, *Symphoricarpos occidentalis*, *Shepherdia argentea*
Herbaceous	*Bouteloua curtipendula*

Globally

Stratum	Species
Shrub	*Shepherdia argentea*

CHARACTERISTIC SPECIES

Badlands National Park

Shepherdia argentea, *Symphoricarpos occidentalis, Toxicodendron rydbergii*, *Ribes odoratum*, *Bouteloua curtipendula*

Globally

Shepherdia argentea

OTHER NOTABLE SPECIES

Badlands National Park

Globally

Stratum	Species
Forb	*Parietaria pensylvanica*
Graminoid	*Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Silver buffalo-berry shrubland occurs as small stands with dense vegetation cover, often greater than 75%. Stands are always dominated by silver buffalo-berry (*Shepherdia argentea*). Western snowberry (*Symphoricarpos occidentalis*) and side-oats

grama (*Bouteloua curtipendula*) are typical understory associates for two of the three stands sampled.

Globally
This community is dominated by a moderate to dense canopy of medium-tall shrubs. The most abundant of these, *Shepherdia argentea*, is typically 1.5-3 m tall. Other species commonly found in the shrub layer are *Juniperus horizontalis, Prunus virginiana, Ribes* spp., *Rhus aromatica, Rosa woodsii*, and *Symphoricarpos occidentalis*. Herbaceous species are not important in this community. Graminoids and forbs may have only half the coverage of the shrub layer (Hansen and Hoffman 1988, USFS 1992). Graminoids include *Poa pratensis, Pascopyrum smithii*, and *Bromus* spp. Common forbs are *Achillea millefolium, Artemisia ludoviciana*, and *Parietaria pennsylvanica*. Litter may accumulate in this community (DeVelice *et al.* 1995).

CONSERVATION RANK G3G4. The number of occurrences is unknown. The community is reported from Montana (where it is ranked S3?), Wyoming (?), Colorado (S1), Saskatchewan (S?), and possibly North Dakota (SP).

DATABASE CODE CEGL001128

MAP UNITS The silver buffalo-berry shrubland is mapped as a separate unit, Map Class 25 (Silver buffalo-berry Shrubland) on the vegetation map.

SIMILAR ASSOCIATIONS
Fraxinus pennsylvanica - Ulmus americana / Prunus virginiana Woodland (The similarity is based on overall composition, but there are few *Fraxinus pennsylvanica* individuals in CEGL001128.)

COMMENTS
Badlands National Park
Stands of silver buffalo-berry shrubland at Badlands NP are small, rarely meeting the minimum mapping unit of 0.5 hectares. An attempt was made to map all silver buffalo-berry shrubland stands in the park, irregardless of stand size. These stands were well-surveyed during preparation of the vegetation map.

Globally
Livestock and deer frequent these thickets and and establish numerous trails throughout. The disturbances open the stands for the invasion of such species as *Symphoricarpos occidentalis, Toxicodendron rydbergii, Achillea millefolium*, and *Artemisia ludovicia.*

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United States Forest Service. 1992. Draft habitat types of the Little Missouri National Grasslands. Medora and McKenzie Ranger Districts, Custer National Forest. Dickinson, ND.

Symphoricarpos occidentalis Shrubland [Provisional]

COMMON NAME	Western Snowberry Shrubland
SYNONYM	Western Snowberry Shrubland
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (III.B.2.N)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d)
ALLIANCE	SYMPHORICARPOS OCCIDENTALIS TEMPORARILY FLOODED SHRUBLAND ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Western snowberry, or wolfberry, shrublands are more common to the South Unit of the park, the largest stands occurring in the Palmer Creek subunit. Small stands are observed in the North Unit, typically less than 300 square meters in size. A giant ragweed - western snowberry stand was observed at one location of approximately 5 hectares along the access road in the Sage Creek Wilderness.

Globally

This community is widespread in western Montana and North Dakota. It is also present in South Dakota, Nebraska, Wyoming, and Saskatchewan.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Western snowberry shrublands occur most commonly in swales, draws, oxbows, and drainage bottoms, that are nearly level. Small stands are also found at the heads of draws on the upper margin of woodlands and mixed shrublands. A few stands were noted on sidehills and slumps, where extra soil moisture is available. Giant ragweed represented the dominant growth form in a drainage channel adjacent to the Park access road.

Globally

This community is found in mesic swales, depressions, ravines and floodplains. Some examples of this community experience intermittent and brief flooding. The soils are fertile and well drained to imperfectly drained silts and loams. The upper soil horizon is usually deep, although a thin layer of sand may be present if the site has been recently flooded (Jones 1995).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Rhus trilobata*, *Rosa arkansana*, *Toxicodendron rydbergii*, *Symphoricarpos occidentalis*
Herbaceous	*Bromus tectorum*, *Bromus japonicus*, *Nassella viridula*, *Pascopyrum smithii*, *Artemisia ludoviciana*

Globally

Stratum	Species
Short Shrub	*Symphoricarpos occidentalis*

CHARACTERISTIC SPECIES

Badlands National Park

Symphoricarpos occidentalis, *Toxicodendron rydbergii*, *Artemisia ludoviciana*, *Pascopyrum smithii*, *Bromus japonicus*

Globally

Symphoricarpos occidentalis

OTHER NOTABLE SPECIES

Badlands National Park

Globally

Stratum	Species
Forb	*Cirsium arvense*
Graminoid	*Pascopyrum smithii, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Western snowberry, or wolfberry, shrublands have dense shrub cover, typically from 70-100%. Often, poison ivy (*Toxicodendron rydbergii*) is the dominant short-shrub in terms of vegetative cover, and this species is always present in the type.

In the southern portion of the park, particularly in the Palmer Creek subunit, western snowberry (*Symphoricarpos occidentalis*) becomes the dominant shrub, and patches of this vegetation type become more extensive. Coincidentally, this is the area where ponderosa pine begin to appear as part of the Rocky Mountain juniper woodland flora. Other than white sagebrush (*Artemisia ludoviciana*), herbaceous species contribute little vegetative cover, the most common being Japanese brome and cheatgrass (*Bromus japonicus* and *Bromus tectorum*), western wheatgrass (*Pascopyrum smithii*), and wild lettuce (*Lactuca serriola*).

One stand of giant ragweed (*Ambrosia trifida*) with western snowberry was observed, covering approximately 5 hectares within a drainage. Vegetation cover was moderate, between 50-75%, with more than 40% provided by giant ragweed plants that exceeded 2m in height. Another important exotic species observed at this site is Kentucky bluegrass (*Poa pratensis*). Shrubs associated with this drainage include American plum (*Prunus americana*) and currant (*Ribes odoratum*).

Globally
Throughout its range this community is dominated by shrubs approximately 1 m tall. Shrub cover is typically greater than 50%, and in places it can approach 100%. These shrubs form dense clumps that exclude most other species. *Symphoricarpos occidentalis* is the most common shrub, but *Rhus aromatica* (or *Rhus trilobata*) and *Prunus virginiana* can be locally abundant and can grow to 2-3 meters in places. Herbaceous species and smaller shrubs are most abundant at the edge of this community and in gaps between the clumps of taller shrubs where the shading is less complete. *Rosa woodsii* is a typical smaller shrub. Common graminoids include *Pascopyrum smithii* and *Poa pratensis*. *Achillea millefolium, Artemisia ludoviciana, Galium boreale*, and *Solidago* spp. are common forbs of this community. Woody vines sometimes occur, including *Parthenocissus vitacea*.

CONSERVATION RANK G4G5. This type is common througout the northen Great Plains. Historically, it may never have been very extensive. It has been observed to grow out from forest or woodland edges and shade out the grasses. It is tolerant of both grazing and fire (Hansen and Hoffman 1988), and is under no threat from human activities. In some cases, heavily grazed pastures may favor this types. Many examples are somewhat weedy; thus the type is not demonstrably secure.

DATABASE CODE CEGL001131

MAP UNITS The western snowberry type corresponds to map class 37 (Western snowberry Shrubland) on the vegetation map. The giant ragweed type was not mapped separately; rather, upon request by TNC it was included with this Western Snowberry Shrubland Map Unit.

SIMILAR ASSOCIATIONS
Fraxinus pennsylvanica - Ulmus americana / Prunus virginiana Woodland (Related in terms of habitat; floristically distinct.)

COMMENTS
Badlands National Park
The western snowberry type consists of generally small patches through most of the park, except for the South Unit. It often forms an extension of mixed shrub communities up the heads of draws and a rim around green ash and Rocky Mountain juniper woodlands. Several stands were visited during the course of the study, and the structure and compositon of stands is very consistent. The giant ragweed stand was observed at only one location, where plot data were recorded.

Globally
The *Symphoricarpos occidentalis* shrubland type occurs as thickets thoughout its range. These thickets are surrounded by grasslands or occasionally by tall shrublands (e.g., *Prunus virginana*). *Symphoricarpos occidentalis* Shrublands often have a significant component of exotic species, especially where grazing has been heavy. *Bromus inermis, Cirsium arvense*, and *Poa pratensis* are among the most abundant of these exotics. Overgrazing of prairies can lead to the expansion of degraded forms of this community. *Symphoricarpos occidentalis* seems to thrive in disturbed areas (Hansen and Hoffman 1988), especially those subject to disturbance by fire and cattle grazing.

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Panicum virgatum Herbaceous Vegetation [Provisional]

COMMON NAME	Wand Panicgrass Herbaceous Vegetation
SYNONYM	Switchgrass Wet-mesic Tallgrass Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Tall sod temperate grassland (V.A.5.N.a)
ALLIANCE	ANDROPOGON GERARDII - (CALAMAGROSTIS CANADENSIS, PANICUM VIRGATUM) HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The switchgrass type is confined to a large basin near Norbeck Pass and a few small drainages in the eastern-most portion of the North Unit.

Globally

This type has been reported from eastern Wyoming and western South Dakota, but its range is not well understood.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Switchgrass is a common component of many wetlands and mesic sites, but is a rare dominant in one large, saturated basin and a few minor drainages of the North Unit.

Globally

Switchgrass is a common component of many wetlands and mesic sites, but becomes dominant in wetter parts of drainages and wetland basins (Von Loh et al. 1999)

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Aster ericoides*, *Glycyrrhiza lepidota*, *Sporobolus heterolepis*, *Schizachyrium scoparium*, *Pascopyrum smithii*, *Panicum virgatum*

Globally

Stratum	Species
Herbaceous	*Aster ericoides*, *Glycyrrhiza lepidota*, *Sporobolus heterolepis*, *Schizachyrium scoparium*, *Pascopyrum smithii*, *Panicum virgatum*

CHARACTERISTIC SPECIES

Badlands National Park

Panicum virgatum, *Pascopyrum smithii*, *Schizachyrium scoparium*, *Glycyrrhiza lepidota*

Globally

Panicum virgatum, *Pascopyrum smithii*, *Schizachyrium scoparium*, *Glycyrrhiza lepidota*

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

The switchgrass herbaceous vegetation type provides dense ground cover, typically between 50-80%. Switchgrass (*Panicum virgatum*) is the dominant species in more mesic areas, western wheatgrass (*Pascopyrum smithii*) is more abundant on elevated sites within the drainages and basins, and little bluestem (*Schizachyrium scoparium*) is the dominant species along the upper margin of the type. Where this type is found in drainages, the distribution often becomes "patchy" and prairie sandreed (*Calamovilfa longifolia*) replaces little bluestem on the upper type margin. Commonly associated species include wild licorice (*Glycyrrhiza lepidota*), white aster (*Aster ericoides*), and occasional cottonwood trees (*Populus deltoides*). All sites supporting this type were visited by researchers during the course of this study.

Globally

In Badland National Park, South Dakota, the switchgrass grassland type provides dense ground cover, typically between 50-80%. *Panicum virgatum* is the dominant species in more mesic areas, *Pascopyrum smithii* is more abundant on elevated sites within the

drainages and basins, and *Schizachyrium scoparium* is the dominant species along the upper margin of the type. Where this type is found in drainages, the distribution often becomes "patchy" and *Calamovilfa longifolia* replaces *Schizachyrium scoparium* on the upper type margin. Commonly associated species include *Glycyrrhiza lepidota*, *Aster ericoides*, and occasional tree stems of *Populus deltoides*.

CONSERVATION RANK G2Q.

DATABASE CODE CEGL001484

MAP UNITS Switchgrass herbaceous vegetation is mapped as a separate unit, Map Class 12 (Switchgrass Grassland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

Extensive areas dominated by switchgrass, as near Norbeck Pass, are rare in the Great Plains and this type is unique in that regard. The basin and drainages which the type dominates are saturated throughout the growing season and some standing water was present at the time of data collection. This type was very well-visited during field data collection.

Global

The concept of this type is still under review, as well as its alliance placement. Other candidate alliances *include Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343), which is currently reported only from the southern United States, and the *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354), which has many floristic affinities with stands in this type.

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Calamovilfa longifolia - Carex inops ssp. heliophila Herbaceous Vegetation

COMMON NAME	Prairie Sandreed - Long-stolon Sedge Herbaceous Vegetation
SYNONYM	Prairie Sandreed - Sedge Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Tall sod temperate grassland (V.A.5.N.a)
ALLIANCE	CALAMOVILFA LONGIFOLIA HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The prairie sandreed type occupies the margins of intermittent drainages, where sediments are deposited (analogous to point bars on flowing rivers).

Globally

This community is found in 3 ecoregional sections in Wyoming, Montana, North Dakota, South Dakota, and Saskatchewan.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Prairie sandreed grassland was found on silt deposits along intermittent drainages. These species are also common components of sand hill sites classified as the Sand Sagebrush Shrubland type.

Globally

Stands are found on gently rolling uplands with little to moderate slopes (typically between 0 and 20%, but occasionally as high as 39%, Hirsch 1985, Hansen and Hoffman 1988). The soils are sand, sandy loam, or loamy sand and there is rarely substantial soil horizon development (Hanson and Whitman 1938). The parent material is sandstone (USFS 1992). Moisture levels may be high deep in the profile.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species

Information not available.

Globally

Stratum	Species
Graminoid	*Calamovilfa longifolia, Carex filifolia, Carex inops ssp heliophila*

CHARACTERISTIC SPECIES

Badlands National Park

Calamovilfa longifolia, *Bouteloua gracilis*, *Stipa comata*, *Melilotus officianalis*

Globally

Calamovilfa longifolia, Carex filifolia, Carex inops ssp *heliophila*

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Koeleria macrantha, Schizachyrium scoparium, Stipa comata*

VEGETATION DESCRIPTION

Badlands National Park

Small stands of prairie sandreed grasslands are found along intermittent drainages. These are only occasionally observed and are always below the minimum mapping unit of 0.5 hectares. Foliar cover is moderate, ranging from 35-60%. The dominant grass is prairie sandreed (*Calamovilfa longifolia*). Needle-and-thread (*Stipa comata*), sideoats grama (*Bouteloua curtipendula*), and purple threeawn (*Aristida purpurea*) are graminoids that were also observed in this type. Commonly occurring forbs include yellow sweetclover (*Melilotus officianalis*), scurfpea (*Psoralidium tenuiflorum*), and white aster (*Aster ericoides*).

Globally

The vegetation structure is somewhat open, with cover averaging 65 percent in parts of its range (USFS 1992). The vegetation is dominated by graminoids, with two strata, one of mid- to tall-grasses, the other of dense short sedges. In the taller grass layer, the most abundant species is *Calamovilfa longifolia*. Other species found in this layer include *Koeleria macrantha, Schizachyrium scoparium*, and *Stipa comata*. *Pascopyrum smithii* may be present on some stands with finer soil textures. The

short graminoid layer is composed chiefly of *Carex filifolia* and *Carex inops* ssp. *heliophila*, which may have high cover values. Other upland Carices, such as *Carex duriuscula (=Carex eleocharis)*, as well as *Bouteloua gracilis* and *Muhlenbergia pungens*, may also be present. Forb species diversity is moderate, but they do not contribute greatly to the cover (Hanson and Whitman 1938, USFS 1992). The forbs that are typical of this community include *Artemisia dracunculus, Artemisia frigida* (a shrub to some)*, Artemisia ludoviciana, Chenopodium album, Chenopodium leptophyllum, Lathyrus* spp., *Liatris punctata, Lygodesmia juncea, Phlox hoodii*, and *Psoralidium lanceolatum*. Shrubs are uncommon. When shrubs are present they are short shrubs such as *Yucca glauca, Rosa spp*., and *Artemisia frigida* (a forb to some).

CONSERVATION RANK G3. No occurrences have been documented, but the community is reported in 3 ecoregional subsections in Wyoming, Montana, North Dakota, South Dakota, and Saskatchewan. It is a very uncommon community in Badlands National Park, South Dakota.

DATABASE CODE CEGL001471

MAP UNITS This type is not mapped separately on the Badlands NP vegetation map. These small inclusions along drainages are typically placed in Map Class 16, (Western wheatgrass Grassland Alliance), because this is the adjacent vegetation community. On sandhills, this type is placed in Map Class 32 (Sand sagebrush / Prairie sandreed Shrubland).

SIMILAR ASSOCIATIONS
Calamovilfa longifolia - Stipa comata Herbaceous Vegetation

COMMENTS
Badlands National Park
Calamovilfa longifolia - Stipa comata Herbaceous Vegetation (CEGL001473) may be an equally good fit.

Prairie sandreed grasslands are uncommon in Badlands NP and are classified under larger, more encompassing vegetation map units. A few sites were sampled during the course of field work at the Park, to help describe grassland variability.

REFERENCES
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Pascopyrum smithii - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation

COMMON NAME	Western Wheatgrass - Blue Grama - Threadleaf Sedge Herbaceous Vegetation
SYNONYM	Western Wheatgrass - Blue Grama - Threadleaf Sedge Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c)
ALLIANCE	PASCOPYRUM SMITHII HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Extensive areas of western wheatgrass - blue grama vegetation are found throughout the Park and the project environs. Associations of this type occupy clay, silt, loam, and sandy soils of flats, swales, drainages, hills, and slopes. The type adjoins little bluestem stands in drainages and on steeper slopes and silver sagebrush shrublands along drainages. In some areas stands of western wheatgrass has been converted to exotic perennial grasses, including smooth brome, Kentucky bluegrass, and crested wheatgrass, or stands have been grazed heavily enough that blue grama is the dominant species.

Globally

This community is found in Colorado, Wyoming, Montana, North Dakota, South Dakota, and Saskatchewan.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Western wheatgrass - blue grama stands occur in a wide variety of habitats throughout the Park. Sites generally are flat to moderately steep in slope and occur on all aspects. This type is more heavily grazed in the South Unit where it may become more heavily dominated by blue grama and threadleaf sedge on drier soils, and Kentucky bluegrass on more mesic sites.

Globally

This community is found on flat or gently sloping terrain. Many stands are on floodplains or gentle valley slopes, others are on uplands. Surface layers of soils are usually clay loams, although stands of this type may also be found on loams, silt loams, silty clays and clays (Hanson and Whitman 1938, Hansen and Hoffman 1988). In Alberta and Saskatchewan this association grows on solonetzic soils (with an elluvial horizon above a dense clay horizon high in sodium salts) developed on thin glacial till over Cretaceous shale (Coupland 1961). This community does not appear to be found in mountain valleys (Hanson and Dahl 1956, Jones 1992).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Bromus japonicus*, *Poa pratensis*, *Nassella viridula*, *Bouteloua gracilis*, *Pascopyrum smithii*

Globally

Stratum	Species
Graminoid	*Bouteloua gracilis, Carex filifolia, Elymus lanceolatus, Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Pascopyrum smithii, *Bouteloua gracilis*, *Nassella viridula*, *Bromus japonicus*

Globally

Bouteloua gracilis, Buchloe dactyloides, Carex filifolia, Elymus lanceolatus, Pascopyrum smithii

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Bromus inermis, Bromus tectorum, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Stands of the western wheatgrass - grama type range from moderate to complete herbaceous cover, between 40-100%. Western wheatgrass (*Pascopyrum smithii*) is strongly dominant in ungrazed stands, less so in stands subjected to annual grazing by livestock. Species dominance can vary locally within a stand, dependent on soils and land use factors. Dominant graminoids are western wheatgrass, blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), and Japanese brome (*Bromus*

japonicus). Other common herbaceous species include green needlegrass (*Nassella viridula*), wild alfalfa (*Psoralidium tenuiflorum*), poverty cactus (*Opuntia polyacantha*), and white sagebrush (*Artemisia ludoviciana*).

In western wheatgrass - grama stands within Badlands NP, species dominance varies within the stand. Western wheatgrass, blue grama, and buffalograss all can be locally dominant, often to the exclusion of other species. For this reason, multiple sample points were taken to characterize this vegetation type.

Globally
This community is dominated by medium and short graminoids. Total vegetation cover is usually high (Hanson and Dahl 1956, Hansen *et al.* 1984). *Pascopyrum smithii* or *Elymus lanceolatus* or both (the two species are similar both morphologically and ecologically) and *Bouteloua gracilis* usually contribute the most cover; however, *Bouteloua gracilis* may contribute little cover and it may be absent locally. *Carex filifolia, Carex duriuscula (=Carex eleocharis), and Carex pensylvanica* often are secondary species, but in many stands they contribute little cover and they may be absent locally. *Stipa comata* usually is present as a secondary species, but it often codominates on sandy loam soils.. In Alberta and Saskatchewan, *Stipa spartea* var. *curtiseta* may be as common as *Stipa comata. Koeleria macrantha* is present in most stands and may contribute substantial cover. The forbs most likely to be found in this association are *Phlox hoodii, Sphaeralcea coccinea, Polygonum ramosissimum, Plantago patagonica, Opuntia polyacantha, Artemisia frigida, Antennaria microphylla*, and *Hedeoma hispida*. In southeastern Montana, western North Dakota, and northeastern Wyoming, stands of this association often contain *Artemisia tridentata ssp. wyomingensis*. Exotic brome grasses, especially *Bromus commutatus* and *B. tectorum*, are present in many stands of this association and they commonly contribute substantial cover (Hanson and Dahl 1956, Coupland 1961, Hansen *et al.* 1984, Hansen and Hoffman 1988).

CONSERVATION RANK G4. The G4 rank is based on the broad geographic range of this type, and its status as a common vegetation type within that geographic range.

DATABASE CODE CEGL001579

MAP UNITS The Western Wheatgrass - Blue Grama - Threadleaf Sedge Herbaceous Vegetation type is included under Map Class 16 (Western wheatgrass Grassland Alliance) on the Badlands NP vegetation map. This map unit includes all western wheatgrass associations. The Western Wheatgrass - Green Needlegrass Herbaceous Vegetation association is mapped separately under Map Class 19 only when it was directly observed during field data collection.

SIMILAR ASSOCIATIONS
Pascopyrum smithii - Bouteloua gracilis Herbaceous Vegetation (is similar to this type but occurs in the southern portion of the Great Plains (where *Carex filifolia* is not as prevalent.)
Pascopyrum smithii - Nassella viridula Herbaceous Vegetation (Drier graminoids, such as *Bouteloua gracilis* or *Carex filifolia* are rare or absent in this type.)
Pascopyrum smithii - Stipa comata Central Mixedgrass Herbaceous Vegetation
Stipa comata - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation (*Stipa comata* contributes more cover than do *Pascopyrum smithii* or *Elymus lanceolatus*, and the association grows on soils of loam or coarser textural classes.)

COMMENTS
Badlands National Park
Western wheatgrass stands are extensive and many sites were visited in preparing the vegetation map. It's possible that other western wheatgrass associations could be recognized at Badlands NP. However, this type and the Western wheatgrass - Green Needlegrass Herbaceous Vegetation association (CEGL001583) appear to be the main ones.

The western wheatgrass - blue grama type ranges from very low diversity on clay flats to high diversity on clay-loam and sandy-loam soils. Where this type intergrades with little bluestem, Kentucky bluegrass, and silver sagebrush, it can become very difficult to classify. Difficulty in classification can also occur on sites grazed annually, because the cool-season western wheatgrass is grazed initially, resulting in warm-season grasses like blue grama appearing to be the stand dominant. During some years, this type will be covered with very tall yellow sweetclover (*Melilotus officianalis*) plants, which have invaded the un-/lightly-grazed North Unit.

Globally
The coverage of *Pascopyrum smithii* varies more with use than geographic range. *Bouteloua gracilis* and *Buchloe dactyloides* have been observed to increase with grazing as *Pascopyrum smithii* decreases. This type, as currently understood by MRO, is equivalent to the *Pascopyrum smithii / Carex filifolia* Herbaceous Vegetation in the Western Region's 1994 classification (Bourgeron and Engelking 1994). Fire was likely a common event in this type historically.

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Pascopyrum smithii - Nassella viridula Herbaceous Vegetation

COMMON NAME	Western Wheatgrass - Green Needlegrass Herbaceous Vegetation
SYNONYM	Western Wheatgrass - Green Needlegrass Mixedgrass Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c)
ALLIANCE	PASCOPYRUM SMITHII HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Large stands of western wheatgrass - green needlegrass occur within the Park, occupying flats, swales, and moderate slopes with clay-loam soils.

Globally

This community is found in Wyoming, Montana, Saskatchewan, Manitoba, North Dakota, and South Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Western wheatgrass - green needlegrass stands occur on deeper soils within the Park, typically on flats on plains and buttes and moderate hillslopes of all aspects.

Globally

This community is found at the bottom of narrow valleys, on stream terraces, and on rolling uplands (Jones 1992, USFS 1992). Soils are fine-textured (clays, silty clays, clay loams, or rarely loams) and well-drained. The soil profile is typically well developed. The parent material is siltstone and mixed sedimentary rock (USFS 1992). This community usually occurs on level or nearly level ground but sometimes may be on moderate slopes of any aspect.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Bromus japonicus*, *Bouteloua gracilis*, *Nassella viridula*, *Pascopyrum smithii*

Globally

Stratum	Species
Graminoid	*Nassella viridula, Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Pascopyrum smithii, *Nassella viridula*, *Bouteloua gracilis*, *Buchloe dactyloides*, *Bromus japonicus*, *Poa pratensis*

Globally

Nassella viridula, Pascopyrum smithii

OTHER NOTABLE SPECIES

Badlands National Park

Globally

Stratum	Species
Graminoid	*Elymus lanceolatus, Koeleria macrantha, Stipa comata*

VEGETATION DESCRIPTION

Badlands National Park

Stands of western wheatgrass - green needlegrass typically have moderate to dense herbaceous cover, ranging from 45-100%. Dominant graminoids include western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Stipa viridula*), blue grama (*Bouteloua gracilis*), and Japanese brome (*Bromus japonicus*). Species dominance varies locally within a stand, particularly for green needlegrass, which is usually present at less than 10% foliar cover, but on some flats it may provide up to 65% vegetative cover. Other common herbaceous species present include white sagebrush (*Artemisia ludoviciana*), white aster (*Aster ericoides*), and scurfpea (*Psoralidium tenuiflorum*).

In stands of western wheatgrass - green needlegrass at Badlands NP, species dominance varies within the stand; therefore, multiple points were sampled to characterize the type.

Globally
This community is dominated by midgrasses, generally between 0.6 and 1 m tall. The vegetation cover tends to be moderate to high, with almost all of the canopy provided by graminoids (Redmann 1975, USFS 1992). The dominant species are *Pascopyrum smithii* and *Nassella viridula*, although *Elymus lanceolatus* (another rhizomatous wheatgrass that is similar in morphology and ecology to *Pascopyrum smithii*) is the dominant species in some stands. At least 5% canopy cover of *Nassella viridula* may be diagnostic for this association. Other common grasses are *Stipa comata, Koeleria macrantha, Poa secunda (=Poa juncifolia), Poa pratensis, Sporobolus cryptandrus*, and, on sandier soils, *Calamovilfa longifolia*. Shorter graminoids are less common, but may include *Bouteloua gracilis, Carex duriuscula (=Carex eleocharis), Carex filifolia, C. inops* ssp. *heliophila*, and *C. pensylvanica*. These species are present in many stands, but they usually contribute little cover. The wheatgrass basin association of Nebraska (Steinauer and Rolfsmeier 1997), which may belong to this association, also contains *Schizachyrium scoparium*. Cheatgrasses (*Bromus commutatus, Bromus japonicus, Bromus tectorum*) are present in many stands and contribute substantial cover in some. The forbs *Aster falcatus, Astragalus spp., Achillea millefolium, Sphaeralcea coccinea, Artemisia ludoviciana, Lepidium densiflorum*, and *Vicia americana* are also typical of this community. *Artemisia cana* ssp. *cana* or *Artemisia tridentata* ssp. *wyomingensis* may be present, often as scattered shrubs contributing little cover. Stands with denser shrubs are transitional to shrub-herbaceous vegetation.

CONSERVATION RANK G3G4. The G3G4 rank is based on the broad geographic distribution and the relatively broad environmental requirements of this association. The prevalence of cheatgrass in many stands, though, may necessitate a review of this rank.

DATABASE CODE CEGL001583

MAP UNITS The western wheatgrass - green needlegrass mixedgrass prairie is mapped as Map Class 19 (Western wheatgrass - Green needlegrass Grassland) on the Badlands NP vegetation map. It should be understood that only stands observed during field work are delineated, because there is no distinction between aerial photo signatures of this class and that of the western wheatgrass herbaceous alliance types. The two types were combined for accuracy assessment.

SIMILAR ASSOCIATIONS
Pascopyrum smithii - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation (Drier graminoids, such as *Bouteloua gracilis* or *Carex filifolia*, tend to predominate in this association.)

COMMENTS
Badlands National Park
It's possible that other western wheatgrass associations could be recognized at Badlands NP. However, this type and the Western Wheatgrass - Blue Grama - Threadleaf Sedge Herbaceous Vegetation association (CEGL001579) appear to be the main ones.

Only occasionally is green needlegrass equal to or greater than western wheatgrass in stand dominance. In many cases, green needlegrass provides less than 10% vegetative cover. During field work, several large stands of western wheatgrass - green needlegrass mixedgrass prairie were sampled to adequately characterize the type. The stands are found more commonly in the North Unit, north of the badlands wall, but large stands were observed on Sheep Mountain Table and on Stronghold Table in the South Unit.

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Schizachyrium scoparium - Bouteloua (curtipendula, gracilis) - Carex filifolia Herbaceous Vegetation

COMMON NAME	Little Bluestem - (Sideoats Grama, Blue Grama) - Threadleaf Sedge Herbaceous Vegetation
SYNONYM	Northern Great Plains Little Bluestem Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c)
ALLIANCE	SCHIZACHYRIUM SCOPARIUM - BOUTELOUA CURTIPENDULA HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Little bluestem grassland occurs in patches along drainageways and along the edges and at the heads of draws, where thin, gravelly soils occur within the Park. The most extensive stands occur in the Palmer Creek Unit associated with stands of short-statured ponderosa pine. Large areas of little bluestem - sideoats grama grassland occur in the environs south of the Palmer Creek Unit and along the breaks of the Cheyenne River in the northwestern project environs.

Globally

This community is found in western North Dakota, western South Dakota, eastern and northern Wyoming, central and eastern Montana, southern Saskatchewan, and southern Manitoba.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Little bluestem stands occur in drainages and on slopes of variable steepness and aspect, as well as on rolling sites. However, sites generally are drier, steeper and/or have shallower soils than sites that support western wheatgrass types. Soils supporting little bluestem stands tend to be gravelly, while those supporting blue grama and western wheatgrass are sandy, silty, or clayey.

Globally

This community is usually found on gentle to steep slopes with variable aspects (Hansen *et al.* 1984, Johnston 1987, Hansen and Hoffman 1988). The soil may be loamy sand, sandy loam, loam, or clay loam. There may be a substantial component of gravel. Hansen *et al.* (1984) found 7-36% gravel by weight in 16 stands in western North Dakota. The soils are typically shallow and occur over sandstone or limestone (Johnston 1987, Thilenius *et al.* 1995).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Bouteloua curtipendula*, *Schizachyrium scoparium*

Globally

Stratum	Species
Graminoid	*Bouteloua curtipendula, Bouteloua gracilis, Schizachyrium scoparium*

CHARACTERISTIC SPECIES

Badlands National Park

Schizachyrium scoparium, *Bouteloua curtipendula*, *Solidago missouriensis*, *Calamovilfa longifolia*, *Symphoricarpos occidentalis*, *Rhus trilobata*

Globally

Bouteloua curtipendula, Bouteloua gracilis, Carex filifolia, Schizachyrium scoparium

OTHER NOTABLE SPECIES

Badlands National Park

Globally

Stratum	Species
Graminoid	*Bromus inermis, Bromus tectorum, Poa pratensis*

VEGETATION DESCRIPTION

Badlands National Park

Little bluestem grasslands typically have moderate to dense cover, ranging from 40 to 90%, with all ground surfaces covered by dense litter. Little bluestem (*Schizachyrium scoparium*) is strongly dominant, and sideoats grama (*Bouteloua curtipendula*) is

almost always present. Other frequently occurring graminoids include prairie sandreed (*Calamovilfa longifolia*) and plains muhly (*Muhlenbergia cuspidata*). Some forbs may be present, but only Missouri goldenrod (*Solidago missouriensis*) and white sagebrush (*Artemisia ludoviciana*) regularly occur in little bluestem stands. The shrubs western snowberry (*Symphoricarpos occidentalis*) and ill-scented sumac (*Rhus trilobata*) may be present. Ill-scented sumac may appear dominant on aerial photos, causing this type to occasionally be identified as a shrubby grassland community.

Globally
This community is predominantly composed of graminoid species less than 1 m tall. Occasional *Pinus ponderosa* are scattered throughout the type. The vegetation cover is moderate to high. Thilenius *et al.* (1995) found that vegetation cover was 44 percent in Wyoming, and Hansen and Hoffman (1988) found 75 percent cover in North Dakota. The dominant species is *Schizachyrium scoparium,* with *Bouteloua curtipendula, Bouteloua gracilis*, and *Carex filifolia* as associates or codominants. *Andropogon gerardii, Carex inops* ssp. *heliophila, Carex duriuscula (= Carex eleocharis), Koeleria macrantha* and *Calamovilfa longifolia* are often present. *Calamovilfa longifolia* may be abundant on sandier soils. *Muhlenbergia cuspidata, Stipa comata, Pascopyrum smithii*, and *Nassella viridula* may also be present. *Pseudoroegneria spicata* may be found in the western portions of this community (Jones 1992). In Manitoba, the graminoids *Festuca ovina* and *Elymus trachycaulus* and the lichen *Selaginella densa* are more abundant (Greenall 1995). Forbs do not contribute greatly to the canopy, but many species may be found in this community (Hanson and Whitman 1938). Among the forbs that may be found are *Echinacea angustifolia, Aster oblongifolius, Aster ericoides, Gaura coccinea, Lygodesmia juncea, Helianthus pauciflorus* ssp. *pauciflorus, Rosa arkansana, Liatris punctata, Pediomelum argophyllum (=Psoralea argophyllum), Dalea purpurea, Phlox hoodii*, and *Campanula rotundifolia*. There are very few woody species; those that are present are usually short shrubs such as *Artemisia frigida, Juniperus horizontalis*, and *Yucca glauca*. Litter often accumulates and may cover more than 50 percent of the ground (Hirsch 1985).

CONSERVATION RANK G3G4.

DATABASE CODE CEGL001681

MAP UNITS The little bluestem - sideoats grama grassland corresponds to Map Class 15 (Little bluestem - Grama grasses - Threadleaf Sedge Grassland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS
Pinus ponderosa / Schizachyrium scoparium Woodland (has similar composition to this type; the presence of *Pinus ponderosa* is the best distinguishing characteristic.)

COMMENTS
Badlands National Park
Significant amounts of little bluestem can be found in other grassland types, particularly along intermittent drainages and in some swales. This intermixing usually occurs within grasslands dominated by western wheatgrass and/or green needlegrass. Little bluestem vegetation is relatively uncommon in the Park, except for the area of the Palmer Creek Unit. In the environs surrounding the Park, particularly the breaks of the Cheyenne River and the ridges south of the Palmer Unit, little bluestem grasslands are very common.

Several stands were visited in preparing the vegetation map; however, aerial photo signatures were variable and only reliable on steep, gravelly slopes.

Globally
This type occurs on variable aspects throughout its range. Hansen *et al.* (1984) and McAdams *et al.* (1998) report this type on southerly aspects for western South Dakota and southwestern North Dakota. In southeast Montana and the Cheyenne River Basin, Butler *et al.* (1986) found that, in a ravine in western North Dakota, the most abundant species on a south-facing footslope were *Bouteloua curtipendula* and *Carex filifolia*. Other species that were abundant were *Schizachyrium scoparium, Calamovilfa longifolia, Stipa comata*, and *Artemisia frigida*. *Pascopyrum smithii, Bouteloua gracilis*, and *Koeleria macrantha* were also present. Fire probably played a major role in this type, whereby periodic fires would increase graminoid production and deter tree growth.

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Agropyron cristatum - (Pascopyrum smithii, Stipa comata) Semi-natural Herbaceous Vegetation

COMMON NAME	Crested Wheatgrass - (Western Wheatgrass, Needle-and-Thread Grass) Semi-natural Herbaceous Vegetation
SYNONYM	Crested Wheatgrass Semi-natural Grassland
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d)
ALLIANCE	AGROPYRON CRISTATUM SEMI-NATURAL HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Introduced, exotic grasslands occur throughout the Park and are associated with disturbances such as roadsides, abandoned farm fields, and areas that were interseeded with exotic grasses to "improve" the range for grazing. Areas especially noted are adjacent to the Park access road and facilities, abandoned agricultural fields along the northern boundary, abandoned agricultural fields on Sheep Mountain Table, and interseeded grasslands on Cuny and Stronghold Tables.

Globally

This type occurs most commonly in the northern Great Plains of the United States and Canada.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Introduced grasslands are on relatively level sites accessible to farming equipment. Typically the soils are silt and/or clay loams, which historically supported western wheatgrass (*Pascopyrum smithii*) alliance grasslands.

Globally

This type can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, jeep trails, etc. It is also widely planted to revegetate pastures and rangelands.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Agropyron cristatum*

Globally

Stratum	Species
Graminoid	*Agropyron cristatum*

CHARACTERISTIC SPECIES

Badlands National Park

Agropyron cristatum, *Pascopyrum smithii*, *Bromus japonicus*, *Psoralidium tenuiflorum*

Globally

Agropyron cristatum, Pascopyrum smithii

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Stands typically have moderate herbaceous cover, ranging from 40-90%, and very dense litter over the ground surface. A few abandoned agricultural fields are dominated by crested wheatgrass (*Agropyron cristatum*), often with a host of invasive species, particularly Japanese brome (*Bromus japonicus*), field bindweed (*Convolvulus arvensis*), and common mullein (*Verbascum thapsus*). Many species of forbs and occasional shrubs are also found in the type.

Globally

The vegetation is dominated by medium-tall (0.5 - 1 m) graminoids. The dominant grass is *Agropyron cristatum*, a naturalized species from Europe. Other weedy species may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Stipa comata*, as well as others.

CONSERVATION RANK GW. This is a naturalized type from Europe, widely planted to revegetate roadsides and pastures.

DATABASE CODE CEGL005266

MAP UNITS The crested wheatgrass grassland type is mapped as part of the Introduced Grassland unit, Map Class 17 on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

The introduced grassland group occupies previously disturbed sites, including roadsides, abandoned agricultural fields, and interseeded rangeland. Stands dominated by the bunchgrass, crested wheatgrass (*Agropyron cristatum*), are more diverse than those of Kentucky bluegrass or smooth brome. One introduced grassland site was observed where prairie dogs had invaded, and through grazing and burrow construction activities were instrumental in reclaiming some of the introduced grassland back to western wheatgrass and blue grama grasslands. Present management of exotic grasses consists of limited mowing and light grazing by bison in the North Unit and heavy grazing by livestock in the South Unit.

Several introduced grassland sites were visited, and the group was well-surveyed into its components during preparation of the vegetation map.

Some smaller areas of annual, exotic vegetation were also encountered during field data collection in support of vegetation map production. These patches of vegetation typically grew around livestock watering areas, such as windmills, and generally were placed under land use Map Class 55, Other Agricultural Land.

Globally

Hansen and Hoffman (1988, p 6, Fig. 6) show a seral stand of *Agropyron cristatum*, with signs of succession leading to the *Stipa comata* / *Carex filifolia* habitat type.

REFERENCES

Hansen, P.L. and G.R. Hoffman. 1988. The vegetation of the Grand River/Cedar River, Sioux, and Ashland Districts of the Custer National Forest: a habitat type classification. USDA Forest Service General Technical Report RM-157, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Bromus inermis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation

COMMON NAME	Smooth Brome - (Western Wheatgrass) Semi-natural Herbaceous Vegetation
SYNONYM	Smooth Brome Semi-natural GrasslandPHYSIOGNOMIC CLASS Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d)
ALLIANCE	BROMUS INERMIS SEMI-NATURAL HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Introduced, exotic grasslands occur throughout the Park and are associated with disturbances such as roadsides, abandoned farm fields, and areas that were interseeded with exotic grasses to "improve" the range for grazing. Areas especially noted are adjacent to the Park access road and facilities, abandoned agricultural fields along the northern boundary, abandoned agricultural fields on Sheep Mountain Table, and interseeded grasslands on Cuny and Stronghold Tables.

Globally

This type occurs widely throughout the northern Great Plains, and perhaps more widely in the Midwest, depending on how the type is defined.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Introduced grasslands are on relatively level sites accessible to farming equipment. Typically the soils are silt and/or clay loams, which historically supported western wheatgrass (*Pascopyrum smithii*) alliance grasslands.

Globally

This type can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, jeep trails, etc. It is also widely planted for cover, pasture, and hay, and has escaped into a variety of habitats.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Bromus inermis*

Globally

Stratum	Species
Graminoid	*Bromus inermis*

CHARACTERISTIC SPECIES

Badlands National Park

Bromus inermis, *Pascopyrum smithii*, *Bromus japonicus*, *Psoralidium tenuiflorum*

Globally

Bromus inermis, Pascopyrum smithii

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Stands of introduced grasses typically have moderate herbaceous cover, ranging from 40-90%, and very dense litter over the ground surface. Along roadsides, smooth brome (*Bromus inermis*) is strongly dominant, with alfalfa (*Medicago sativa*) and yellow sweetclover (*Melilotus officianalis*) included in the plantings along State Highways. Many species of forbs and occasional shrubs are also found in the type.

Globally

The vegetation is dominated by medium-tall (0.5 - 1 m) graminoids. The dominant grass is *Bromus inermis*, a naturalized species from Europe and Asia. Other weedy species may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Stipa comata*, as well as others.

CONSERVATION RANK GW. This is a naturalized type from Europe and Asia, widely planted for cover, pasture, and hay, and has escaped into a variety of habitats.

DATABASE CODE CEGL005264

MAP UNITS Smooth brome grasslands are mapped as part of the Introduced Grassland unit, Map Class 17 on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

Several brome grassland sites were visited, and the type was well-surveyed into its components during preparation of the vegetation map. Some smaller areas of annual, exotic vegetation were also encountered during field data collection in support of vegetation map production. These patches of vegetation typically grew around livestock watering areas, such as windmills, and generally were placed under land use Map Class 55, Other Agricultural Land.

The introduced grassland group occupies previously disturbed sites, including roadsides, abandoned agricultural fields, and interseeded rangeland. Stands of bromegrass tend to be monotypic. They tend to have dense litter layers which impede other species establishment and also serves to store moisture following precipitation events. One introduced grassland site was observed where prairie dogs had invaded, and through grazing and burrow construction activities were instrumental in reclaiming some of the introduced grassland back to western wheatgrass and blue grama grasslands. Present management of exotic grasses consists of limited mowing and light grazing by bison in the North Unit and heavy grazing by livestock in the South Unit.

Globally

This type could be defined very broadly to include almost any *Bromus inermis* dominated stand, in which case the variability of the minor species associated with the type may be very high.

REFERENCES

Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation

COMMON NAME	Kentucky Bluegrass - (Western Wheatgrass) Semi-natural Herbaceous Vegetation
SYNONYM	Kentucky Bluegrass Semi-natural Grassland
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d)
ALLIANCE	POA PRATENSIS SEMI-NATURAL HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Introduced, exotic grasslands occur throughout the Park and are associated with disturbances such as roadsides, abandoned farm fields, and areas that were interseeded with exotic grasses to "improve" the range for grazing. Areas especially noted are adjacent to the Park access road and facilities, abandoned agricultural fields along the northern boundary, abandoned agricultural fields on Sheep Mountain Table, and interseeded grasslands on Cuny and Stronghold Tables.

Globally

This type is potentially widespread throughout the Great Plains and into the Midwest, depending on how the type is defined.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Introduced grasslands are on relatively level sites accessible to farming equipment. Typically the soils are silt and/or clay loams, which historically supported western wheatgrass (*Pascopyrum smithii*) alliance grasslands.

Globally

This type can occur in a wide variety of human-disturbed and native habitats.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Poa pratensis*

Globally

Stratum	Species
Graminoid	*Poa pratensis*

CHARACTERISTIC SPECIES

Badlands National Park

Poa pratensis, *Pascopyrum smithii*, *Bromus japonicus*, *Psoralidium tenuiflorum*

Globally

Pascopyrum smithii, Poa pratensis

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Stands of introduced grasses typically have moderate herbaceous cover, ranging from 40-90%, and very dense litter over the ground surface. Many abandoned agricultural fields and selected range interseeding sites are strongly dominated by Kentucky bluegrass (*Poa pratensis*). In some cases, a few plants of western wheatgrass (*Pascopyrum smithii*) and fairly large stands of ragweed (*Ambrosia psilostachya*) may also be present. Many species of forbs and occasional shrubs are also found in the type.

Globally

The vegetation is dominated by medium-tall (0.5 - 1 m) graminoids. The dominant grass is *Poa pratensis*, considered to be both a native and naturalized species from Eurasia (Great Plains Flora Association 1986, Gleason and Cronquist 1991). Other native species may occur as well, but they are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Stipa comata*, as well as others.

CONSERVATION RANK GW. This is primarily a naturalized type from Europe and Asia, widely planted for lawns and pasture, and it has escaped into a variety of habitats (Great Plains Flora Association 1986, Gleason and Cronquist 1991). Although native populations do exist,and may be integral parts of some prairie and other native habitats, most stands that are thoroughly dominated by *Poa pratensis* are a result of human modifications to the habitat.

DATABASE CODE CEGL005265

MAP UNITS Kentucky bluegrass grasslands are mapped as part of the Introduced Grassland unit, Map Class 17 on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

The introduced grassland group occupies previously disturbed sites, including roadsides, abandoned agricultural fields, and interseeded rangeland. Stands of Kentucky bluegrass tend to be monotypic. They tend to have dense litter layers that impede other species establishment and also serves to store moisture following precipitation events. One introduced grassland site was observed where prairie dogs had invaded, and through grazing and burrow construction activities were instrumental in reclaiming some of the introduced grassland back to western wheatgrass and blue grama grasslands. Present management of exotic grasses consists of limited mowing and light grazing by bison in the North Unit and heavy grazing by livestock in the South Unit.

Several introduced grassland sites were visited, and the units were well-surveyed into their components during preparation of the vegetation map.

Some smaller areas of annual, exotic vegetation were also encountered during field data collection in support of vegetation map production. These patches of vegetation typically grew around livestock watering areas, such as windmills, and generally were placed under land use Map Class 55, Other Agricultural Land.

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Bouteloua gracilis - Buchloe dactyloides Xeric Soil Herbaceous Vegetation

COMMON NAME	Blue Grama - Buffalo Grass Xeric Soil Herbaceous Vegetation
SYNONYM	Blue Grama - Buffalo Grass Xeric Soil Shortgrass Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Short sod temperate or subpolar grassland (V.A.5.N.e)
ALLIANCE	BOUTELOUA GRACILIS HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The blue grama grassland type is limited to the dry edges of buttes and dry hilltops within the North Unit and is more widespread because of soils and regular livestock grazing in the South Unit. In the South Unit, this type occupies hilltops, ridges, and sandy soils that are not dominated by yucca or sand sagebrush shrubs.

Globally

This community is found in western North Dakota, western South Dakota, extreme northwestern Nebraska, and Saskatchewan, and should also be in Wyoming and Montana.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Blue grama grasslands are limited to drier soils within the project area and areas with a consistent grazing regime, including that provided by prairie dogs. Most sites are relatively flat to undulating, typically on the edges of buttes/tables, ridgetops, and hilltops. Flat sites are typically clay and silty clay soils, while ridges and hilltops tend to be sandy soils. Blue grama and its associated species are common understory components of western wheatgrass grasslands. Grazing reduces the ground cover provided by western wheatgrass, a mid-grass, allowing the shorter blue grama and its associates to dominate.

Globally

This community is found on dry slopes or xeric soils with a high clay content. In Nebraska this type can occur on level to gently sloping ground on stream terraces. Soils are poorly drained silty clay and clay. In Badlands National Park, South Dakota, stands are limited to drier soils within the project area and areas with a consistent grazing regime, including that provided by prairie dogs. Most sites are relatively flat to undulating, typically on the edges of buttes/tables, ridgetops, and hilltops. Flat sites are typically clay and silty clay soils, while ridges and hilltops tend to be sandy soils. Blue grama and its associated species are common understory components of western wheatgrass grasslands. Grazing reduces the ground cover provided by western wheatgrass, a mid-grass, allowing the shorter blue grama and its associates to dominate (Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Opuntia polyacantha*, *Artemisia filifolia*, *Yucca glauca*, *Gutierrezia sarothrae*
Herbaceous	*Bromus tectorum*, *Bromus japonicus*, *Pascopyrum smithii*, *Stipa comata*, *Buchloe dactyloides*, *Carex filifolia*, *Bouteloua gracilis*

Globally

Stratum	Species
Short Shrub	*Artemisia filifolia, Gutierrezia sarothrae, Opuntia polyacantha, Yucca glauca*
Graminoid	*Bouteloua gracilis, Buchloe dactyloides*

CHARACTERISTIC SPECIES

Badlands National Park

Bouteloua gracilis, *Carex filifolia*, *Pascopyrum smithii*, *Bromus japonicus*

Globally

Bouteloua gracilis, Buchloe dactyloides, Carex filifolia, Pascopyrum smithii

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

The blue grama grassland type provides moderate to high vegetative cover, typically between 40-90%. Blue grama (*Bouteloua gracilis*) is usually strongly dominant on sandier soils, while threadleaf sedge (*Carex filifolia*) is a strong dominant on clay and

silty clay soils at the edge of bluffs and tables. Species commonly associated with blue grama on sandier soils include threadleaf sedge, western wheatgrass (*Pascopyrum smithii*), needle-and-thread (*Stipa comata*), buffalograss (*Buchloe dactyloides*), purple three-awn (*Aristida purpurea*), Japanese brome (*Bromus japonicus*), and a variety of forbs. Shrubs that are typically observed in this type include fringed sagewort (*Atremisia frigida*), poverty cactus (*Opuntia polyacantha*), yucca (*Yucca glauca*), and snakeweed (*Gutierrezia sarothrae*). On Red Shirt Table, blue grama grassland types are overgrown by horseweed (*Conyza canadensis*), which grows to 1.5 m tall by late summer.

Species commonly associated with threadleaf sedge on clay and silty clay soils include needle-and-thread, Japanese brome, cheatgrass, blue grama, and prairie coneflower (*Ratibida columnifera*). Typical shrubs are the same as those listed in the above paragraph.

Globally
The blue grama grassland type provides moderate to high vegetative cover, typically between 40-90%. *Bouteloua gracilis* is usually strongly dominant on sandier soils, while *Carex filifolia* is a strong dominant on clay and silty clay soils at the edge of bluffs and tables. In Badlands National Park, South Dakota, common associates on sandier soils include *Pascopyrum smithii, Stipa comata, Buchloe dactyloides, Aristida purpurea, Bromus japonicus*, and a variety of forbs, including *Conyza canadensis*. Shrubs that are typically observed in this type include *Atremisia frigida, Opuntia polyacantha, Yucca glauca*, and *Gutierrezia sarothrae*. Species commonly associated with *Carex filifolia* on clay and silty clay soils include *Stipa comata, Bouteloua gracilis, Bromus japonicus*, and *Ratibida columnifera*. Typical shrubs are the same as those listed on sandy soils. (Von Loh *et al.* 1999). Forbs in Nebraska include *Lomatium foeniculaceum, Monolepis nuttalliana, Musineon divaricatum, Oonopsis multicaulis*, and *Plantago elongata*. Shrubs are sparse to absent, and include *Artemisia tridentata, Artemisia cana, Artemisia frigida*, and, more westward in Nebraska, *Chrysothamnus nauseosus* and *Sarcobatus vermiculatus* (Steinauer and Rolfsmeier 1997).

CONSERVATION RANK G3G5. The natural distribution of this type may be limited to special xeric soil sites in the northwestern Great Plains. However, it is not clear how these sites compare floristically to similar looking stands on heavily grazed pastures that are widespread in the same region. Hence, the exact rank is uncertain.

DATABASE CODE CEGL002270

MAP UNITS The blue grama grassland type is presented as Map Class 18 (Blue Grama Grassland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS
Bouteloua gracilis - Buchloe dactyloides Herbaceous Vegetation (The more widespread shortgrass association of the southern Great Plains.)
Pascopyrum smithii - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation (On heavily grazed sites, this type can be degraded to CEGL002270.)
Stipa comata - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation (On degraded sites, or on intermediate habitats, this type can be confused with CEGL002270. Generally, it occupies less xeric sites than CEGL002270.)

COMMENTS
Badlands National Park
Many stands were visited in preparing the vegetation map. It is possible that the name of this type could be changed to the *Stipa comata - Bouteloua gracilis - Carex filifolia* Herbaceous Vegetation association, but all descriptions would remain the same under either title. Insufficient range-wide information is available to clarify how best to name the stands in Badlands NP.

The blue grama grassland type occupies butte/table margins and sandy ridges, flats, and hilltops. Along the butte and table tops, this type is rather narrow and ribbon-like in distribution. On sandy ridges, flats, and hilltops, this type is widespread, particularly in the heavily grazed South Unit and the surrounding project environs. Grazing helps to dry soils by removing/limiting mid and tall grass growth from the landscape and by the action of livestock hooves breaking the ground surface or by burrowing activities as with prairie dogs. Blue grama vegetation is common where heavy grazing and/or sandy soils are present and less common where the type is limited to butte/table margins.

Globally
Dave Ode (1998) makes the following comments with respect to CEGL002270 in southwestern South Dakota (Fall County) and its relation to CEGL001756, which at this time is not in South Dakota: "I looked at the NRCS Tech Guide and several county soil surveys to get a better idea of the extent and distribution of this range site [claypan range site]. It always occurs on sodium-affected soils with less than four inches of topsoil over an impervious hardpan. (There is also a claypan rangesite that has 40% midgrasses and only 25% shortgrasses). Thin claypans often occur in association with slickspots or rock outcrops (shale), i.e. areas that are so bad that they have no perennial vegetation. Topographically, thin claypans lie on footslopes, broad flats, alluvial fans, and linear strips along drainageways. They generally have very shallow slopes, i.e. less than 5%. These areas range from 10 to 400 acres in size."

"In terms of percent of the landscape, here are a few rough numbers that I calculated from the Soil Surveys: Fall River 6%, Custer/Pennington Prairie 2%, Shannon County 3%, Harding County is tough to estimate because of the mixed associations but

probably about 5%. My tendency would be to lump these in with the northern Badlands shortgrass community type and revise the definition to include these thin claypan flats. You could change the name to xeric soil rather than xeric slope. At an even coarser level I see the central shortgrass region as having the matrix occurrences of this type, as you move north you have these large patch occurrences on claypans and maybe other unique soils, and by the time you get to Saskatchewan you just have small patches on Badland slopes."

"Some complicating factors that would tend to split this one out are that many of these claypans are on floodplains and could end up being called riparian. In terms of species composition, because of the high salt content, many forbs don't grow on these soils and with overuse saltgrass (Distichlis) apparently can increase in abundance (I can' t tell from the NRCS data how constant or abundant saltgrass is on these range sites, except that they mention it increasing under over-grazing.) In terms of forb composition, it's pretty depauperate but probably would be more similar to dense clay habitats than even to this badlands slope communty. Several forbs, e.g. coneflower, globemallow, wild parsley that are mentioned in the central shortgrass type do occur on these claypans and everywhere else. In one sense it's handy to have two blue grama/buffalograss types, e.g. if you want to see patches of blue grama prairie go to the Northern Plains (CEGL002270), if you want to see blue grama prairie landscapes go to the Central Plains (CEGL001756)."

Others have observed that this type can also appear to occur in heavily grazed pastures; however, these heavily grazed pastures probably would have been classified as wheagrass - blue grama prairie (CEGL001579) prior to such grazing, and can revert back to that type fairly quickly (3-5 years?) if grazing is removed. In general it would be better to restrict CEGL002270 to only the xeric soil habitats.

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Spartina pectinata - Carex spp. Herbaceous Vegetation

COMMON NAME	Prairie Cordgrass - Sedge species Herbaceous Vegetation
SYNONYM	Prairie Cordgrass - Sedge Wet Meadow
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j)
ALLIANCE	SPARTINA PECTINATA TEMPORARILY FLOODED HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Badlands National Park

The prairie cordgrass wetland is rare within Badlands NP, restricted to the margins of linear wetlands with a perennial hydrologic regime. A good example is Kinney Creek at the northern edge of the North Unit.

Globally

This type is found in the northwestern Great Plains in eastern Montana and western North and South Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Prairie cordgrass wetland stands occur in drainage bottoms, along perennial stream courses, forming a patchy mosaic with other wetland species.

Globally

At Wind Cave NP in South Dakota, stands occur in drainage bottoms where the soil is wet for at least part of the growing season (H. Marriot personal communication 1999). At Theodore Roosevelt and Badlands National Parks, stands occur in poorly drained depressions within floodplains of major rivers.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Scirpus americanus*, *Carex* spp., *Spartina pectinata*

Globally

Stratum	Species
Graminoid	*Spartina pectinata*

CHARACTERISTIC SPECIES

Badlands National Park

Spartina pectinata, *Carex* spp., *Scirpus americanus*, *Eleocharis palustris*

Globally

Spartina pectinata

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Carex nebrascensis, Hordeum jubatum*

VEGETATION DESCRIPTION

Badlands National Park

Prairie cordgrass stands within Badlands NP are small, but dense. Aerial cover of the entire herbaceous layer is typically estimated at 75-100%. Prairie cordgrass (*Spartina pectinata*) is the dominant species. The stands occupy moist soils and occur adjacent to spikerush (*Eleocharis palustris*), water smartweed (*Polygonum amphibium*), cattails (*Typha angustifolia*, *Typha latifolia*), and bulrush (*Scirpus americanus* (= *Scirpus pungens*)) stands, these latter stands occupying saturated to inundated soils. Adjacent uplands are typically vegetated by western wheatgrass (*Pascopyrum smithii*) grasslands.

Globally

At Wind Cave NP in South Dakota, this type has dense herbaceous cover, greater than 75 percent. Species dominance is patchy within stands, with various graminoids locally abundant, often to the exclusion of other species. In the single sampled stand, *Spartina pectinata, Carex nebrascensis*, and *Eleocharis palustris* were locally dominant. *Epilobium ciliatum* was common in shallow water (H. Marriott pers. comm. 1999). At Theodore Roosevelt National Park in North Dakota *Spartina pectinata* is the dominant species. Species richness is generally low. *Hordeum jubatum* and *Pascopyrum smithii* are the most prominent

secondary species (J. Butler personal communication 1999). At Badlands National Park in South Dakota, Prairie cordgrass stands are small, but dense. Aerial cover of the entire herbaceous layer is typically estimated at 75-100%. *Spartina pectinata* is the dominant species. The stands occupy moist soils and occur adjacent to spikerush *Eleocharis palustris*, *Polygonum amphibium*, *Typha angustifolia*, *Typha latifolia,* and *Scirpus americanus* (= *Scirpus pungens*) stands, these latter stands occupying saturated to inundated soils. Adjacent uplands are typically vegetated by *Pascopyrum smithii*.

CONSERVATION RANK G3?. This type has a relatively restricted distribution, and occurs in somewhat specialized wetland habitats in an arid climate. In addition, many such wetland sites are subject to heavy grazing pressure by cattle, who favor these moist locations. No element occurrences have been documented for this type, but at least several stands occur within three National Parks in the western Dakotas.

DATABASE CODE CEGL001477

MAP UNITS Prairie cordgrass stands are one type included in Map Class 14 (Emergent Wetlands).

SIMILAR ASSOCIATIONS

Spartina pectinata - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (This is the northern tallgrass region equivalent of 1477.)

Spartina pectinata - *Scirpus pungens* Herbaceous Vegetation (This association may simply need to be split between a *Scirpus pungens* association and a *Spartina pectinata* association.)

COMMENTS

Badlands National Park

Prairie cordgrass stands or patches only occur along perennial flowing waters of slow-moving creeks in Badlands NP. Outside the Park, they are also observed along irrigation and water collection ditches.

Globally

Sites may occasionally flood from rivers or ponding up of depressions.

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Eleocharis palustris Herbaceous Vegetation

COMMON NAME	Pale Spikerush Herbaceous Vegetation
SYNONYM	Creeping Spikerush Wet Meadow
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k)
ALLIANCE	ELEOCHARIS PALUSTRIS SEASONALLY FLOODED HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Species of spikerush are common throughout the Park, but cover relatively small acreages associated with saturated/inundated soils. Saturated soils occur in depressions, drainages, along pond margins, and along water conveyance ditches.

Globally

This association is found in Montana, Utah, California, Nevada, Washington, Idaho, Oregon, Cororado, Wyoming, Nebraska, South Dakota, and Saskatchewan.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Spikerush vegetation is best developed in depressions on broad level sites that hold water for at least part of the growing season. Species of spikerush are present in nearly every wetland site on the Park and in its environs.

Globally

In northwest Nebraska, this community occurs in small depressions in intermittent stream beds that flood early in the season and dry out by summer. Soils are silty clay formed from weathered siltstone and shale (Steinauer and Rolfsmeier 1997).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Eleocharis compressa*, *Eleocharis palustris*

Globally

Stratum	Species

Information not available.

CHARACTERISTIC SPECIES

Badlands National Park

Eleocharis palustris, *Eleocharis compressa*, *Eleocharis acicularis*, *Hordeum jubatum*, *Sagittaria cuneata*

Globally

Information not available.

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Species of spikerush (*Eleocharis palustris*, *Eleocharis compressa*, and *Eleocharis acicularis*) are found in nearly pure stands where they occupy entire depressions or form a "zone" around other types of wetlands. Vegetative cover is usually very dense, between 50-75% at most sites. Shallow areas are more conducive to annual species, particularly *Eleocharis acicularis* and *Hordeum jubatum*. Deeper water typically contains some spikerush, but here the species give way to taller emergents, primarily *Typha* spp. and *Scirpus* spp.

Globally

In northwestern Nebraska, stands are dominated by submersed and emergent rooted vegetation under 1 m tall. *Eleocharis acicularis* and *Eleocharis palustris* commonly cover the bottoms of the pools and emerge above the water as the pools dry out. Ephemeral submersed aquatics, such as *Callitriche verna, Potamogeton diversifolius* and *Marsilea vestita*, may be present. As the pools dry out in mid-summer, ephemeral annual forbs, such as *Limosella aquatica* and *Plagiobothrys scouleri*, may appear. By late summer *Amaranthus californicus* and *Gnaphalium palustre* may dominate in the lowest parts of the depression (Steinauer and Rolfsmeier 1997). At Wind Cave NP in South Dakota, vegetation is composed of nearly homogeneous stands of *Eleocharis palustris* (pale spikerush). Other emergents, such as *Polygonum amphibium* (water smartweed), *Marsilea vestita* (hairy water-

fern), and *Eleocharis ovata* (ovate spikerush) are occasionally found. Herbaceous cover is greater than 75 percent except in areas of deeper open water where floating and submerged aquatic plants occur, including *Bacopa rotundifolia* (roundleaf water-hyssop) and *Heteranthera limosa* (blue mud-plantain) (H. Marriott pers. comm. 1999).

CONSERVATION RANK G5.

DATABASE CODE CEGL001833

MAP UNITS The spikerush community is one type included in Map Class 14 (Emergent Wetlands). A case could be made for two spikerush communities at Badlands, as both *Eleocharis compressa* and *Eleocharis palustris* form mono-dominant stands in the park.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

The spikerush emergent wetland type is found throughout the Park, almost always in stands that are below the project minimum mapping unit. An effort was made to identify and interpret every wetland, no matter the size, including narrow drainages as a line coverage. Typical habitats are depressions on flats or in basins, which receive runoff following precipitation events. These sites are often visited by bison within the Park and by cattle outside the Park, presumably for the water and more vigorous vegetation growing there.

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Typha spp. - Scirpus spp. - Mixed Herbs Great Plains Herbaceous Vegetation

COMMON NAME	Cattail species - Bulrush species - Mixed Herbs Great Plains Herbaceous Vegetation
SYNONYM	Great Plains Cattail - Bulrush Marsh
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.5.N)
FORMATION	Semipermanently flooded temperate or subpolar grassland (V.A.5.N.l)
ALLIANCE	TYPHA (ANGUSTIFOLIA, LATIFOLIA) - (SCIRPUS SPP.) SEMIPERMANENTLY FLOODED HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Badlands National Park

Cattail-bulrush wetlands occur throughout the park, occupying depressions, drainages, seeps, springs, and ponds where saturated soils or shallow standing water is present on a more-or-less permanent basis.

Globally

This community ranges broadly over the northern Great Plains of the United States.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Cattail-bulrush wetlands occupy flats, slow-flowing drainages, sidehill and toeslope seeps and springs, and the edges of ponds and small reservoirs.

Globally

Stands occur in basin-like depressions, backwater areas of floodplains and shallow margins of lakes or ponds. Hydrology varies from seasonally flooded to semipermanently flooded.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Hordeum vulgare*, *Juncus* spp., *Scirpus americanus*, *Scirpus validus*, *Typha angustifolia*, *Typha latifolia*

Globally

Stratum	Species
Graminoid	*Scirpus acutus, Scirpus tabernaemontani, Typha angustifolia, Typha latifolia*

CHARACTERISTIC SPECIES

Badlands National Park

Typha angustifolia, *Scirpus americanus*

Globally

Scirpus acutus, Scirpus tabernaemontani, Typha angustifolia

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Graminoid	*Eleocharis palustris, Leersia oryzoides*

VEGETATION DESCRIPTION

Badlands National Park

Naturally occurring, emergent wetlands growing along slow-moving creeks are dominated by prairie cordgrass (*Spartina pectinata*), spikerush, three-square bulrush (*Scirpus americanus* or *Scirpus pungens*), and softstem bulrush (*Scirpus validus*). Vegetative cover for emergent wetlands established along streams is dense, between 75-100% in most cases. Emergent wetlands that have formed around and in constructed ponds and reservoirs are dominated by species of cat-tail (*Typha angustifolia* and *Typha latifolia*) and bulrush (*Scirpus validus* and *Scirpus americanus*). These sites may also support some wetland shrubs such as sandbar willow (*Salix exigua*). Typically, vegetative cover in emergent wetlands of disturbed sites ranges from approximately 50-90%.

Globally

Vegetation varies from zones dominated by tall emergents 1-2 m tall to those with floating-leaved or submerged aquatics in the deeper margins and perennial forbs <1 m tall in the shallower margins. In the tall emergent zone, *Scirpus ssp. (tabernaemontani, fluviatilis, acutus)* and *Typha spp. (angustifolia, latifolia)* may dominate, mixed with a variety of other herbaceous species, such

as *Leersia oryzoides, Eleocharis palustris, Juncus spp*. and *Sparganium spp*. Floating-leaved and submerged aquatics are sometimes present, including *Azolla caroliniana, Lemna spp., Spirodela polyrrhiza*, and *Potamogeton spp*. (Steinauer and Rolfsmeier 1997).

CONSERVATION RANK G4G5. Although occurring in very small patches in the Great Plains, this relatively simple floristic association may be very widespread.

DATABASE CODE CEGL002228

MAP UNITS Cattail - bulrush wetlands are mapped under map class 14 (Emergent Wetlands) on the Badlands NP vegetation map. Linear wetlands are prepared as a line coverage. Almost all emergent wetlands are below the minimum mapping unit of 0.5 hectares, but are readily observable on the aerial photographs. Other wetlands mapped as separate units include those dominated by switchgrass (*Panicum virgatum*), map class 12 and sandbar willow (*Salix exigua*), map class 38.

SIMILAR ASSOCIATIONS
Scirpus tabernaemontani - Typha spp. - (Sparganium spp., Juncus spp.) Herbaceous Vegetation
Scirpus tabernaemontani Temperate Herbaceous Vegetation
Typha latifolia Western Herbaceous Vegetation
Typha spp. Great Plains Herbaceous Vegetation

COMMENTS
Badlands National Park
Many wetland sites were encountered and sampled during the course of fieldwork at Badlands NP. It is possible that a number of separate wetland associations could have been recognized, e.g. relatively pure stands of *Typha* spp. or *Scirpus pungens*, but stands were in general so small (<<0.5 ha) that such an approach did not seem practical.

Cattail - bulrush wetlands represent a regulated resource and are a valuable wildlife habitat. The presence of wetlands and ponded water controls the movement of livestock and many wildlife species, particularly bison, the largest grazing mammal on the park.

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Rhus trilobata / Carex filifolia Shrub Herbaceous Vegetation

COMMON NAME	Ill-scented Sumac / Threadleaf Sedge Shrub Herbaceous Vegetation
SYNONYM	Ill-scented Sumac / Thread-leaved Sedge Shrub Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.7.N)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.g)
ALLIANCE	RHUS TRILOBATA SHRUB HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Stands of sparse ill-scented sumac occur throughout the park along the upper cliff borders of buttes, and on some ridges and knolls. Moderately sparse stands occupy hillslope slumps near Cedar Pass, near a road-cut on Red Shirt Table, and along the White River Valley. Dense stands of ill-scented sumac are present in the Sage Creek Wilderness of the park's North Unit, along the Cheyenne River drainage, northwest of the park boundary, and at the base of various sand hill complexes.

Globally

This community is found in eastern Montana, western North Dakota, and western South Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Sparse stands of ill-scented sumac occur most commonly on very steep slopes, where the upper butte cliffs meet the well-vegetated butte top and along the edge of draws. The geologic formation of cliff faces is predominantly Brule siltstone that is rapidly eroding, resulting in small ledges, nearly vertical faces, and steep slopes with rocks and fine sediments. Dense stands of ill-scented sumac occur sporadically within Badlands NP, but are a regular landscape feature along the breaks of the Cheyenne River, northwest of the park. They occupy ridgetops and hillslopes with gravelly to sandy soils; one stand is located in a large slump just east of Cedar Pass. A few stands are located in old oxbows along the White and Cheyenne Rivers.

Globally

This community occurs on moderate to steep slopes on protected ridgetops and upper slopes of draws (Johnston 1987, USFS 1992). Hansen and Hoffman (1988) found four stands in western South Dakota on sandy loam soil. In Badlands National Park, South Dakota, sparse stands of ill-scented sumac occur most commonly on very steep slopes, where the upper butte cliffs meet the well-vegetated butte top and along the edge of draws. The geologic formation of cliff faces is predominantly Brule siltstone that is rapidly eroding, resulting in small ledges, nearly vertical faces, and steep slopes with rocks and fine sediments. Dense stands of ill-scented sumac occur sporadically within Badlands National Park, but are a regular landscape feature along the breaks of the Cheyenne River, northwest of the park. They typically occupy ridgetops and hillslopes with gravelly to sandy soils, though a few stands are located in old oxbows along the White and Cheyenne Rivers (Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Ribes odoratum*, *Prunus virginiana*, *Symphoricarpos occidentalis*, *Toxicodendron rydbergii*, *Chrysothamnus nauseosus*, *Yucca glauca*, *Rhus trilobata*
Herbaceous	*Poa pratensis*, *Mentzelia decapetala*, *Schizachyrium scoparium*, *Bouteloua curtipendula*

Globally

Stratum	Species
Short Shrub	*Rhus trilobata*
Graminoid	*Bouteloua curtipendula, Carex filifolia*

CHARACTERISTIC SPECIES

Badlands National Park

Rhus trilobata, *Yucca glauca*, *Chrysothamnus nauseosus*, *Toxicodendron rydbergii*, *Artemisia cana*, *Bouteloua curtipendula*, *Schizachyrium scoparium*, *Mentzelia decapetala*, *Artemisia ludoviciana*, *Symphoricarpos occidentalis*, *Ribes odoratum*, *Prunus virginiana*

Globally

Carex filifolia, Muhlenbergia cuspidata, Rhus trilobata

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Short Shrub	*Chrysothamnus nauseosus, Prunus virginiana, Ribes aureum var villosum, Symphoricarpos occidentalis, Toxicodendron rydbergii, Yucca glauca*
Graminoid	Koeleria macrantha, Muhlenbergia cuspidata, Poa pratensis, Schizachyrium scoparium, Stipa comata

VEGETATION DESCRIPTION

Badlands National Park

This ill-scented sumac shrub herbaceous type occurs either as open shrubland with an open graminoid cover or as denser shrubland. The open shrubland variant typically has vegetation cover values of less than 30% because of its scattered nature along the top of cliff faces and along the edge of draws. Ill-scented sumac (*Rhus trilobata*) is clearly dominant, with each individual shrub covering a relatively large area. Other short shrubs commonly associated with ill-scented sumac include yucca (*Yucca glauca*), silver sagebrush (*Artemisia cana*), rabbitbrush (*Chrysothamnus nauseosus*), and poison-ivy (*Toxicodendron rydbergii*). Sideoats grama (*Bouteloua curtipendula*) is nearly always an understory associate and little bluestem (*Schizachyrium scoparium*) is the dominant grass along many draws. The dense shrubland variant has moderate to dense vegetative cover, depending on the landscape location. Sites with extra available soil moisture, such as seeps and slumps or old river oxbows, support dense vegetative cover in the 75-100% range. Sites on ridges and hilltops support less vegetative cover, in the 50-75% range. Ill-scented sumac is typically the overstory dominant, but in terms of vegetative cover, western snowberry (*Symphoricarpos occidentalis*), poison ivy (*Toxicodendron rydbergii*), and chokecherry (*Prunus virginiana*) can contribute nearly equal amounts. Understory grasses often include little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), and Kentucky bluegrass (*Poa pratensis*).

Globally

This community is dominated by herbaceous vegetation, overtopped by a shrub canopy of 10-25%. The tallest shrubs are typically 0.6 m tall (Hansen and Hoffman 1988). Total coverage is moderate; exposed mineral soil is common. The USFS (1992) found an average vegetation cover of 70% on 10 stands in western North Dakota, most of that graminoids and shrubs. The most abundant shrub is *Rhus trilobata*, with lesser amounts of *Artemisia frigida, Gutierrezia sarothrae, Rosa arkansana*, and *Symphoricarpos occidentalis*. The most abundant herbaceous species is *Carex filifolia*, usually accompanied by *Koeleria macrantha, Muhlenbergia cuspidata*, and *Stipa comata. Carex inops* ssp. *heliophila* and *Elymus lanceolatus* are found in the shade of shrubs. Forbs have very low coverage. Common forbs include *Artemisia dracunculus, Echinacea angustifolia, Dalea purpurea, Opuntia polyacantha*, and *Phlox andicola*.

In Badlands National Park, South Dakota, this sparse shrubland is found along with a more densely shrubby variant. The dense shrubland variant has moderate to dense vegetative cover, depending on the landscape location. Sites with extra available soil moisture, such as seeps and slumps or old river oxbows, support dense vegetative cover in the 75-100% range. Sites on ridges and hilltops support less vegetative cover, in the 50-75% range. *Rhus trilobata* is typically the overstory dominant, but in terms of vegetative cover, *Symphoricarpos occidentalis, Toxicodendron rydbergii*, and *Prunus virginiana* can contribute nearly equal amounts. Understory grasses often include *Schizachyrium scoparium, Bouteloua curtipendula*, and *Poa pratensis* (Von Loh *et al.* 1999).

CONSERVATION RANK G3. This community has a relatively restricted range, being found in three states. It is relatively small patch in scale. It was considered to be an infrequent type in National Forest areas sampled in the western Dakotas and southeastern Montana (Hansen and Hoffman 1988).

DATABASE CODE CEGL001504

MAP UNITS The two variants of the ill-scented sumac shrub grassland type are mapped together as Map Class 35 (Ill-scented sumac / Threadleaf sedge Shrub Grassland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

Rhus trilobata / Festuca idahoensis Shrub Herbaceous Vegetation
Rhus trilobata / Pseudoroegneria spicata Shrub Herbaceous Vegetation
Rhus trilobata / Schizachyrium scoparium Shrub Herbaceous Vegetation

COMMENTS

Badlands National Park

Although stands of ill-scented sumac are classified as the *Rhus trilobata / Carex filifolia* Shrub Herbaceous Vegetation type, they appear to contain very little *Carex filifolia*. They may fit better with the *Rhus trilobata / Schizachyrium scoparium* Shrub Herbaceous Vegetation type, reported from Montana. That type has not yet been described globally, so further review is still needed.

Sparse ill-scented sumac stands occur sporadically within the park, but are more common along butte tops and in draws that support little bluestem (*Schizachyrium scoparium*) grasslands. Both of these situations are more commonly observed in the park's South Unit. In some cases, it may not be possible to determine whether a stand is a sparse shrubland versus a grassland with scattered shrubs from the ground. In the dense shrub variant, the co-dominant species found with ill-scented sumac stands

are also present in the understory of other shrub communities, particularly American plum (*Prunus americana*) stands. These stands are very extensive and best represented in the Cheyenne River breaks. Several stands were visited, including a few that had been regularly grazed by livestock.

Globally

Although stands of ill-scented sumac in Badlands National Park are classified as the *Rhus trilobata / Carex filifolia* Shrub Herbaceous Vegetation type, they appear to contain very little *Carex filifolia*. They may fit better with the *Rhus trilobata / Schizachyrium scoparium* Shrub Herbaceous Vegetation type (CEGL001506), reported from Montana. That type has not yet been described globally, so further review is still needed.

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Yucca glauca / Calamovilfa longifolia Shrub Herbaceous Vegetation

COMMON NAME	Soapweed Yucca / Prairie Sandreed Shrub Herbaceous Vegetation
SYNONYM	Soapweed / Prairie Sandreed Shrub Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.7.N)
FORMATION	Medium-tall temperate grassland with a sparse xeromorphic (often thorny) shrub layer (V.A.7.N.h)
ALLIANCE	YUCCA GLAUCA SHRUB HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Yucca shrub grasslands occupy sandy ridges and silty clay flats on butte edges within the park and the slopes of scarp canyons along the Cheyenne River breaks northwest of the park. Sandy ridges occur predominantly in the South Unit near the White River, but one prominent sandy ridge is also present on the North Unit.

Globally

This type is found in the northwestern Great Plains, including eastern Wyoming and Montana, and western South Dakota.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Yucca shrub grasslands occur most commonly as small stands of shrubs near the edge of buttes. These shrublands are also associated with sand hill complexes, where they occupy the lower sandy ridges as the dominant shrub, but also intergrade with sand sagebrush (*Artemisia filifolia*) on sandy slopes and hills.

Globally

Stands dominated by *Stipa comata* are more typically found only along sandstone outcrop ridge tops and a short distance down the adjacent slopes (the *Yucca glauca / Stipa comata* association of Thilenius *et al.* 1995). Soils are relatively deep (> 1 m), pure sands, with medium to coarse-textured lower horizons. The substrate is well-drained, but not xeric. Stands with *Calamovilfa longifolia* occur on a broader range of ridge tops and upper slopes (*Yucca glauca / Calamovilfa longifolia* association of Thilenius *et al.* 1995).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Yucca glauca*
Herbaceous	*Bromus tectorum*, *Carex filifolia*, *Sporobolus cryptandrus*, *Bouteloua gracilis*

Globally

Stratum	Species
Short Shrub	*Yucca glauca*
Graminoid	*Bouteloua gracilis, Calamovilfa longifolia, Carex filifolia, Stipa comata*

CHARACTERISTIC SPECIES

Badlands National Park

Yucca glauca, *Bouteloua gracilis*, *Sporobolus cryptandrus*, *Calamovilfa longifolia*, *Carex filifolia*

Globally

Bouteloua gracilis, Calamovilfa longifolia, Stipa comata, Yucca glauca

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Yucca shrub grasslands have a sparse cover of yucca (*Yucca glauca*) shrubs, typically between 15-25%, but they usually have good cover in the herbaceous stratum. This plant association rarely has other shrubs present; rather, the understory species change relative to soil types. On silty clay to clay soils, threadleaf sedge (*Carex filifolia*) dominates, while on clay soils western wheatgrass (*Pascopyrum smithii*) provides dense understory cover. Sandy ridges dominated by yucca also support prairie sand-reed grass (Calamovilfa longifolia), sand dropseed (*Sporobolus cryptandrus*), sand bluestem (*Andropogon hallii*), and purple three-awn (*Aristida purpurea*) in abundance.

Globally
Stands contain an open to moderately dense (at least 10% cover), low-shrub layer above a species-rich herbaceous layer. Dominance of the shrub layer by *Yucca glauca* is characteristic (average cover in 6 stands was 9.8%). *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia cana* ssp. *cana* may be present but are sparse and contribute little cover. In the herbaceous layer, *Stipa comata* and *Calamovilfa longifolia* codominate (16% cover and 8% cover, respectively), and *Bouteloua gracilis* and *Carex filifolia* often are present but contribute much less cover than do *Stipa* or *Calamovilfa*. Forbs are common but contribute little cover; *Artemisia frigida* (dwarf shrub-like) has the highest constancy, but no forb is characteristic of the association. Litter covers up to about half of the ground surface, and most of the rest of the ground surface is bare soil.

CONSERVATION RANK G4.

DATABASE CODE CEGL002675

MAP UNITS Yucca shrub grasslands are mapped under map class 21 (Soapweed yucca / Prairie sandreed Shrub Grassland) on the Badlands NP vegetation map.

SIMILAR ASSOCIATIONS

COMMENTS
Badlands National Park
The yucca shrub grassland type can occur as very small stands or patches on the landscape, which are difficult to map. This community intergrades and may be co-dominant with sand sagebrush (*Artemisia filifolia*) on higher sand ridges and hillslopes/tops. Several stands were visited during the course of the study, and they appeared quite consistent in vegetation structure and composition. One instance of illegal collection of yucca shrubs, presumably for their home landscape values, was witnessed on Sheep Mountain Table.

Globally
In Badlands National Park, South Dakota vegetation cover varies with soil conditions. Sandy soils have characteristic dominants, but on more silty clay soils, *Carex filifolia* and *Pascopyrum smithii* may dominate.

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Sarcobatus vermiculatus / Pascopyrum smithii Shrub Herbaceous Vegetation

COMMON NAME	Greasewood / Western Wheatgrass Shrub Herbaceous Vegetation
SYNONYM	Greasewood / Western Wheatgrass Shrub Prairie
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (V.A.7.N)
FORMATION	Intermittently flooded temperate or subpolar grassland with a sparse xeromorphic (evergreen and/or deciduous) shrub layer (V.A.7.N.n)
ALLIANCE	SARCOBATUS VERMICULATUS INTERMITTENTLY FLOODED SHRUB HERBACEOUS ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 1

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The greasewood shrubland vegetation type is uncommon to Badlands NP, with small stands occurring on flats on Cuny Table, along a drainage near Plenty Star Table, and on a small ridge in the Sage Creek Wilderness.

Globally

This community is found in eastern Wyoming, Montana, southern Saskatchewan, western North Dakota, western South Dakota, and western Nebraska.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Greasewood shrubland occurs on an alkaline flat, an alkali-affected drainageway, and a small ridge, the last two sites have a strong odor of selenium. It is occasionally flooded on the flat, and occupies areas with subsurface ground water seepage along the small drainage. Within the drainage, greasewood replaces silver sagebrush (*Artemisia cana*), which grows at slightly lower elevations.

Globally

This community is found on flat to gently sloping alluvial fans, terraces, lakebeds, and floodplains (Mueggler and Stewart 1978, Hansen and Hoffman 1988). Dodd and Coupland (1966) found *Sarcobatus vermiculatus* in association with *Pascopyrum smithii* only on the most arid parts of southwest Saskatchewan. The soil is usually deep clay, silty clay, sandy clay, or loam (Hirsch 1985, Jones and Walford 1995), although coarse soils are possible (USFS 1992, Thilenius *et al.* 1995). They are saline or alkaline but salt crusts on the surface are absent (Thilenius *et al.* 1995, but see Steinauer and Rolfsmeier 1997). Parent material is usually alluvium. Flooding during the spring is possible.

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Gutierrezia sarothrae*, *Eriogonum pauciflorum*, *Sarcobatus vermiculatus*
Herbaceous	*Cryptantha thyrsifolia*, *Grindelia squarrosa*, *Atriplex argentea*, *Bouteloua curtipendula*, *Pascopyrum smithii*

Globally

Stratum	Species
Short Shrub	*Sarcobatus vermiculatus*
Graminoid	*Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Sarcobatus vermiculatus, *Eriogonum pauciflorum*, *Gutierrezia sarothrae*, *Atriplex argentea*, *Grindelia squarrosa*

Globally

Pascopyrum smithii, Sarcobatus vermiculatus

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Short Shrub	*Artemisia tridentata ssp wyomingensis*
Graminoid	*Bouteloua gracilis, Distichlis spicata, Poa secunda*

VEGETATION DESCRIPTION

Badlands National Park

Greasewood shrubland vegetation cover is sparse, generally below 15% cover. Greasewood (*Sarcobatus vermiculatus*) is the dominant large shrub and other species occur in a patchy distribution between individuals and clumps of greasewood. Typical species include the dwarf-shrubs *Eriogonum pauciflorum* and *Gutierrezia sarothrae*, the graminoids *Pascopyrum smithii* and *Bouteloua curtipendula*, and the forbs *Atriplex argentea*, *Grindelia squarrosa*, and *Cryptantha thyrsifolia*.

Globally

This community has moderate to dense vegetation cover (Jones and Walford 1995, Thilenius *et al.* 1995). Medium-tall (0.5-1.5 m) shrubs are scattered throughout, with a total shrub canopy of 10-25% (Hansen and Hoffman 1988, USFS 1992). The shrub layer is dominated by *Sarcobatus vermiculatus*, with *Atriplex confertifolia, A. argentea, Artemisia tridentata*, and *Chrysothamnus viscidiflorus* in smaller amounts. *Symphoricarpos occidentalis* and *Rhus aromatica* are sometimes found in more mesic microhabitats within this community (Hirsch 1985). Herbaceous cover is sparse beneath the shrubs and moderate to dense in between. The dominant species are typically 0.5-1 m tall. The most abundant species is *Pascopyrum smithii*, usually accompanied by *Bouteloua gracilis, Bromus japonicus, B. tectorum*, and *Stipa comata*. Few forbs are found in this community. *Achillea millefolium* and *Opuntia polyacantha* are the only species with high constancy. Other species present may include *Grindella squarrosa*. Overall species diversity in this community is low (Hansen and Hoffman 1988, Von Loh *et al.* 1999).

CONSERVATION RANK G4.

DATABASE CODE CEGL001508

MAP UNITS The greasewood shrubland type is mapped as a separate unit, Map Class 39 (Greasewood / Western wheatgrass) on the vegetation map.

SIMILAR ASSOCIATIONS

Sarcobatus vermiculatus / Elymus elymoides - Pascopyrum smithii Shrubland

COMMENTS

Badlands National Park

Stands of greasewood shrubland are small and uncommon in the park. Only stands with shrubs large enough to be observed on aerial photographs are included in the mapping. Stands that occur in small drainages are easily confused with silver sagebrush (*Artemisia cana*) stands on aerial photography. Short-statured greasewood shrubs that are distributed across the badlands landscape are included in Map Class 2, Badlands Sparse Vegetation Complex, for mapping purposes. Greasewood shrublands were surveyed when they were encountered during preparation of the vegetation map.

Globally

Some authors recognize a *Sarcobatus vermiculatus / Pseudoroegneria spicata* Shrub Herbaceous Vegetation (Hansen and Hoffman 1988, MTNHP 1988, USFS 1992) in addition to or combined with *S. vermiculatus / Pascopyrum smithii* Shrub Herbaceous Vegetation (Brown 1971).

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Blacktailed Prairie Dog Town Grassland Complex

COMMON NAME Blacktailed Prairie Dog Town Grassland Complex
SYNONYM Blacktailed Prairie Dog Town Grassland Complex
PHYSIOGNOMIC CLASS ()
PHYSIOGNOMIC SUBCLASS ()
PHYSIOGNOMIC GROUP ()
PHYSIOGNOMIC SUBGROUP ()
FORMATION ()
ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Black-tailed prairie dog (Cynomys ludovicianus) towns are widespread within Badlands NP and its environs, where soils are deep enough and have sufficient structure to support burrowing activity. Towns may range in size from less than one hectare to several hundred hectares; the largest occur adjacent to and contiguous with the Conata Basin. A black-footed ferret (Mustela nigripes) reintroduction program is underway within Badlands NP, to help return this predator of prairie dogs to portions of its former range.

Globally

This complex occurs widely throughout the Great Plains of the central United States. The blacktailed prairie dogs (*Cynomys ludovicianus ludovicianus*) occur on the Great Plains and the whitetailed prairie dogs (*Cynomus leucurus*) occur in the Great Basin (Knight 1994). Prairie dog towns historically covered millions of hectares in the Great Plains; currently their towns range in size from tens to hundreds of hectares, with an average density of 10 to 55 animals/ha (Whicker and Detling 1988).

ENVIRONMENTAL DESCRIPTION

Badlands National Park

Prairie dog towns are located on clay, clay loam, silty loam and some sandy loam soils deposited following erosion from adjacent uplands, including badlands formations. The soils are primarily derived from the Brule, Chadron, and Pierre Shale formations. Soils are deep, structured and not easily eroded. This type is found on level sites along drainages, in broad valleys, on gentle to moderately sloping hillslopes, and flats on tables and buttes.

Globally

Prairie dog towns are located on a wide variety of soils, including clay, clay loam, silty loam and some sandy loam soils deposited following erosion from adjacent uplands, including badlands formations. Soils are deep, structured and not easily eroded. This type is found on level sites along drainages, in broad valleys, on gentle to moderately sloping hillslopes, and flats on tables and buttes (Von Loh *et al.* 1999). Prairie dogs create extensive burrows in their towns. Large volumes of soil are moved, improving filtration, hastening the incorporation of organic matter, facilitating nutrient cycling, and increasing the spatial heterogeneity of vegetation, soils, and other ecosystem components (Knight 1994).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Herbaceous	*Verbena bracteata*, *Conyza ramosissima*, *Hedeoma hispida*, *Dyssodia papposa*, *Aristida purpurea*, *Buchloe dactyloides*, *Pascopyrum smithii*

Globally

Stratum	Species
Short Shrub	*Artemisia frigida*
Forb	*Dyssodia papposa*
Graminoid	*Aristida purpurea, Bouteloua gracilis, Buchloe dactyloides, Pascopyrum smithii*

CHARACTERISTIC SPECIES

Badlands National Park

Pascopyrum smithii, *Aristida purpurea*, *Dyssodia papposa*, *Hedeoma hispida*, *Conyza ramosissima*, *Verbena bracteata*

Globally

Aristida purpurea, Artemisia frigida, Bouteloua gracilis, Conyza ramosissima, Dyssodia papposa, Hedeoma hispida, Pascopyrum smithii, Verbena bracteata

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

The prairie dog towns are extremely variable in their vegetation characteristics, which are dependent largely on age of town, soil type, and population density (as it relates to grazing frequency). Vegetation cover averages between 30-80% with frequent patches of 100% cover. The vegetation sometimes occurs in relatively concentric zones, relating to outward expansion of town boundaries over time. Abandoned towns, towns with sparse prairie dog populations, and the outer edges of most towns are typically dominated by western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), and/or buffalograss (*Buchloe dactyloides*). Vegetation is typically patchy in distribution, and towns may encompass other plant associations as they expand, including emergent wetlands and badlands complex vegetation (no burrows are dug in these types, they merely become surrounded). The more common patches of vegetation within towns include purple three-awn (*Aristida purpurea*), fetid dogweed (*Dyssodia papposa*), dwarf conyza (*Conyza ramosissima*), field bindweed (*Convolvulus arvensis*), and large-bract verbena (*Verbena bracteata*).

Prairie dog towns are patchy in terms of species distribution, with dominance varying locally within a stand of vegetation. This is typical of early successional species on disturbed sites.

Globally

Blacktailed prairie dog towns are located in open mixedgrass or shortgrass prairie habitat, and their activity has both direct and indirect effects on the vegetation. The blacktailed prairie dogs keep the surrounding vegetation clipped close to the ground, presumably to improve their ability to detect stalking predators. This clipping gives the impression of a mowed lawn, or overgrazed rangeland. Cover averages between 30 and 80%, but some patches may be 100%. Prairie dogs repeatedly clip and graze plants, rarely allowing shoots to reach full size. Thus, canopy height within the colony is about 5-10 cm, compared to 20-50 cm in nearby, uncolonized grassland (Whicker and Detling 1988). Changes in plant species composition may begin as early as 2 or more years after colonization. Shortgrass species, such as *Bouteloua gracilis* and *Buchloe dactyloides*, and annual forbs become abundant and replace mid-height or tall grasses, such as *Pascopyrum smithii*. Continued heavy grazing may eventually result in complete dominance by a few species of forbs or dwarf shrubs, such as *Artemisia frigida, Dyssodia papposa*, and *Aristida purpurea* (Whicker and Detling 1988). Grazing may even cause genetic shifts within species. The shorter, more prostrate, growth forms of *Pascopyrum smithii* on prairie dog towns have been shown to be more abundant than those away from towns, suggesting that some genotypes within the species may tolerate grazing better than others (Jaramillo and Detling 1988, Whicker and Detling 1988).

Bison may be attracted to the prairie dog towns, and a series of studies found that bison preferentially graze them (Coppock *et al.* 1983, Coppock and Detling 1986, Day and Detling 1990). The forage on the colonies is more nutritious than off, with higher nitrogen content and younger shoots, apparently because the animal waste products are deposited there. In turn, the presence of bison waste products further increases the soil fertility and forage quality (Knight 1994). Pronghorns may also prefer the prairie dog towns (Knight 1994). Plant species diversity is increased by the small-scale disturbances caused by the digging of prairie dogs, and animal species diversity may also increase because of the habitat provided for the badger, rattlesnake, burrowing owl, black-footed ferret, and cottontail, in addition to the bison and pronghorn (Knight 1994).

Prairie dog towns also move over time, expanding and contracting, and, as larger towns can cover thousands of hectares at a time, the effect on the prairie landscape is substantial.

The plant community types on a prairie dog colony are roughly indicative of the extent of herbivore disturbance and reflect the cumulative impact of grazing intensity, grazing duration, activities of other animals, soil characteristics, and weather (Whicker and Detling 1988). Early stages of the town may have a typical mixed grass or shortgrass prairie type. With continued grazing and age of the town, the composition may shift to a mix of annual species and dwarf-shrubs. These latter stages have not been classified, but are treated here as a complex. Species richness appears to be highest under moderate levels of disturbance, because grass species have not yet begun to disappear, but forb species have begun to increase.

CONSERVATION RANK G4. This rank has been assigned based on the G4 rank that is currently assigned to the Blacktailed prairie dog itself. However, more careful review of the rank from a community perspective is needed.

DATABASE CODE CECX002003

MAP UNITS The Prairie Dog Town Complex is mapped as a separate unit, Map Class 1 (Prairie Dog Town Complex), on the vegetation map. Where prairie dogs occupy other plant associations, but have not yet altered the existing vegetation, their towns are mapped as the vegetation class present, overlain with a stippled pattern of dots. In this example, the area covered by prairie dog town is calculated as a plant community on the vegetation map, and it is also included in a second calculation that records the area of prairie dog town.

SIMILAR ASSOCIATIONS

Pascopyrum smithii - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation
Pascopyrum smithii - Nassella viridula Herbaceous Vegetation

COMMENTS

Badlands National Park

The disturbance-related vegetation occurs on the naturally-disturbed soils of prairie dog towns. Prairie dog town disturbed vegetation is quite patchy in distribution, and variable in terms of species distribution, with dominance varying locally within a stand. This is typical of early successional species on disturbed sites.

Prairie dog towns at Badlands NP range from less than a hectare to over 200 hectares in size. The Prairie Dog Town Complex was well-surveyed during the preparation of the vegetation map.

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Shale Barren Slopes Sparse Vegetation

COMMON NAME	Shale Barren Slopes Sparse Vegetation
SYNONYM	Shale Barren Slopes
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Consolidated rock sparse vegetation (VII.A)
PHYSIOGNOMIC GROUP	Sparsely vegetated cliffs (VII.A.1)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.A.1.N)
FORMATION	Cliffs with sparse vascular vegetation (VII.A.1.N.a)
ALLIANCE	OPEN CLIFF SPARSE VEGETATION ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Mappable stands of Shale Barren Slopes Sparse Vegetation occur within the Cheyenne River drainage, northwest of the park boundary. This area is under private ownership and was not accessible for survey.

Globally

A few stands are reported in areas near Badlands National Park (Von Loh *et al.* 1999).

ENVIRONMENTAL DESCRIPTION

Badlands National Park

This vegetation type was not observed within the boundaries of Badlands NP. Mappable stands of shale barren slopes occur on private land within the Cheyenne River drainage, and were not surveyed during this study.

Globally

Information not available

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Information not available.	

Globally

Stratum	Species
Information not available.	

CHARACTERISTIC SPECIES

Badlands National Park

Information not available.

Globally

Information not available.

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

Mappable stands of shale barren slopes occur within the Cheyenne River drainage, northwest of the park boundary. This area is under private ownership and was not accessible for survey.

Globally

Information not available

CONSERVATION RANK G?.

DATABASE CODE CEGL002294

MAP UNITS The Shale Barren Slopes Sparse Vegetation type was included in the Badlands Sparse Vegetation Complex, Map Class 2, on the vegetation map. There is no separate map class for this vegetation type.

SIMILAR ASSOCIATIONS

Quercus macrocarpa / Carex inops ssp. *heliophila* Woodland (this woodland type also occurs on shale in western South Dakota).

COMMENTS

Badlands National Park

Shale barren slopes were not observed within Badlands NP. Only a few small areas of this sparse vegetation type are included on

the vegetation map, in the environs northwest of the park, because the current study area includes only a small amount of the Cheyenne River drainage. No shale barren slopes were surveyed during preparation of the vegetation map.

REFERENCES

Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota (Final Report). Technical Memorandum No. 8260-00-02. U.S. Bureau of Reclamation Technical Service Center. Denver Colorado.

Artemisia longifolia Badlands Sparse Vegetation

COMMON NAME	Longleaf Sage Badlands Sparse Vegetation
SYNONYM	Badlands Longleaf Sage Sparse Vegetation
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Unconsolidated material sparse vegetation (VII.C)
PHYSIOGNOMIC GROUP	Sparsely vegetated soil slopes (VII.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.C.3.N)
FORMATION	Dry slopes (VII.C.3.N.b)
ALLIANCE	ARTEMISIA LONGIFOLIA SPARSELY VEGETATED ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The Long-leaf Sagebrush Badlands Sparse Vegetation type is rare within Badlands NP, restricted to small patches on exposed clay knobs and hillslopes.

Globally

This type is found in the badlands regions of the northern Great Plains.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

The long-leaf sagebrush type occupies exposed clay soils on hillslopes and knobs (haystack mounds) weathered from the Chadron Formation. This type is rarely observed and occurs in small patches of less than 250 square meters.

Globally

Stands, which may be less than 0.1 ha in size (at least in Badlands National Park, South Dakota, are found on sparsely vegetated eroding slopes or flat clay ridges. Some slopes may be acidic, others more alkaline. Soils are poorly consolidated clays and silts. Stands may be particularly common on bentonite clay bands found on the ridges and slopes of the badlands (Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Atriplex canescens*, *Eriogonum pauciflorum*, *Gutierrezia sarothrae*, *Artemisia longifolia*

Globally

Stratum	Species
Information not available.	

CHARACTERISTIC SPECIES

Badlands National Park

Artemisia longifolia, *Gutierrezia sarothrae*

Globally

Artemisia longifolia, Eriogonum pauciflorum, Gutierrezia sarothrae

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Short Shrub	*Artemisia longifolia, Atriplex nuttallii*

VEGETATION DESCRIPTION

Badlands National Park

This long-leaf sagebrush type typically has less than 5% cover. The type is extremely rare at Badlands NP, occupying small areas of exposed Chadron Formation clays. Species that are often present are long-leaf sagebrush (*Artemisia longifolia*) and snakeweed (*Gutierrezia sarothrae*).

Globally

The vegetation is sparse, often much less than 10% cover, and species richness is very low. Short shrubs are the most conspicuous. *Artemisia longifolia* is the most frequent, and it may be associated with *Atriplex nuttallii*, *Eriogonum pauciflorum*, or *Gutierrezia sarothrae*.

CONSERVATION RANK G?.

DATABASE CODE CEGL002195

MAP UNITS The Long-leaf Sagebrush Sparse Vegetation type is included in the Badlands Sparse Vegetation Complex, Map Class 2, on the vegetation map. There is no separate map unit for this type.

SIMILAR ASSOCIATIONS
Badlands Sparse Vegetation Complex (This badlands complex includes this association.)
Eroding Great Plains Badlands Sparse Vegetation (This type contains virtually no vegetation.)

COMMENTS
Badlands National Park
This long-leaf sagebrush type is only rarely observed in the park, occurring in small patches on the slopes of eroded Chadron Formation clays. They occur as small inclusions within the Badlands Sparse Vegetation Complex. Only a few stands were surveyed during preparation of the vegetation map. A two hectare stand of *Atriplex canescens* is included in this type. It occupies a large badlands flat and erosion fan, consisting of hardpacked silty clay. This area collects and holds run-off water for a period of time following rainfall. The shrubs are large (0.5-2 m) and trap windblown particles of silt and clay, creating mounds up to 0.5 m high (Von Loh *et al.* 1999). Associated shrubs include *Gutierrezia sarothrae* and *Opuntia polyacantha*. Associated herbs include *Salsola iberica*, *Pascopyrum smithii*, *Bouteloua gracilis*, and *Stipa comata*.

Globally
In Badlands National Park, South Dakota, a two hectare stand of *Atriplex canescens* is included in this type. It occupies a large badlands flat and erosion fan, consisting of hardpacked silty clay. Associated shrubs include *Gutierrezia sarothrae* and *Opuntia polyacantha*. Associated herbs include *Salsola iberica*, *Pascopyrum smithii*, *Bouteloua gracilis*, and *Stipa comata* (Von Loh *et al.* 1999).

REFERENCES
Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota (Final Report). Technical Memorandum No. 8260-00-02. U.S. Bureau of Reclamation Technical Service Center. Denver Colorado.

Eroding Great Plains Badlands Sparse Vegetation

COMMON NAME	Eroding Great Plains Badlands Sparse Vegetation
SYNONYM	Eroding Great Plains Badlands
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Unconsolidated material sparse vegetation (VII.C)
PHYSIOGNOMIC GROUP	Sparsely vegetated soil slopes (VII.C.3)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.C.3.N)
FORMATION	Dry slopes (VII.C.3.N.b)
ALLIANCE	LARGE ERODING BLUFFS SPARSE VEGETATION ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

Badland formations are widespread within Badlands NP, covering approximately 45% of the park area, and are exposed as spires, cliffs, ridges, slopes, narrow gorges, buttes, mounds, fans, and drainages. This type covers the most sparsely vegetated or unvegetated portions of the badlands formations.

Globally

This type is found in the badlands formations of the western Great Plains of the United States and Canada.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

This type is found on eroded formations of Oligocene Brule siltstone and Chadron clayey mudstone and shale, and Miocene Arickaree sandstone. Brule formation siltstone is often capped by Rocky Ford volcanic ash and may also contain veins of chalcedony. Soils are undeveloped, poor, loose, and easily eroded; the topography tends to be somewhat sloping to vertical.

Globally

Badlands are produced by a combination of factors, including elevation, type of rainfall, carving action of streams, and a particular material. Badlands are basically a type of mature dissection with a finely-textured drainage pattern and steep slopes. Badlands can only form where the land lies well above its local base level. The land must also be easily erodable, or vegetation cover will stabilize the surface. An arid climate will also discourage vegetation growth and will tend to have infrequent, but torrential, rains with great eroding action. In the Great Plains, the geologic formations are from Cretaceous shales, Oligocene siltstones, sandstones, and cleyey mudstones (Von Loh *et al*. 1999). The soils in the Great Plains badlands are generally poorly consolidated clays with bands of sandstone or isolated conglomerates (Froiland 1990).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Information not available.	

Globally

Stratum	Species
Information not available.	

CHARACTERISTIC SPECIES

Badlands National Park

Eriogonum pauciflorum, *Gutierrezia sarothrae*, *Grindelia squarrosa*

Globally

Eriogonum pauciflorum, Grindelia squarrosa, Gutierrezia sarothrae

OTHER NOTABLE SPECIES

VEGETATION DESCRIPTION

Badlands National Park

This type is virtually devoid of any vegetation, typically less than 1% vegetative cover. On the steeper slopes and cliffs, what little vegetation there is, may grow in patches and in rows or seams. Plant species that may be present include small-flowered wild buckwheat (*Eriogonum pauciflorum*), snakeweed (*Gutierrezia sarothrae*), and curlycup gumweed (*Grindelia squarrosa*).

Globally

The clay soils of the badland eroding slopes and walls are almost devoid of vegetation. Widely scattered individuals of *Grindelia squarrosa*, *Gutierrezia sarathroe*, or *Eriogonum pauciflorum* may be present (Froiland 1990).

CONSERVATION RANK G4G5.

DATABASE CODE CEGL002050

MAP UNITS The Eroding Great Plains Badlands Sparse Vegetation is mapped as part of Map Class 2 (Badlands Sparse Vegetation Complex) on the vegetation map.

SIMILAR ASSOCIATIONS
Artemisia longifolia Badlands Sparse Vegetation
Badlands Sparse Vegetation Complex (This complex includes this association.)
Eriogonum pauciflorum - Gutierrezia sarothrae Badlands Sparse Vegetation
Shale Barren Slopes Sparse Vegetation

COMMENTS
Badlands National Park
This type occupies naturally eroded features of the Brule siltstone, and Chadron clayey mudstone and shale formations. The vegetation is patchy or even linear on steeper slopes and along drainages. Many truly barren cliffs, slopes and mounds are present. Barren slopes of Pierre shale are described as a separate type - Shale Barrens Slopes Sparse Vegetation. Badlands formations shed water rapidly following precipitation events and reflect a tremendous amount of solar energy. Other associations with somewhat more vegetation, though still sparse, have also been described in the badlands complex. These include the *Artemisia longifolia* Badlands Sparse Vegetation and the *Eriogonum pauciflorum - Gutierrezia sarothrae* Badlands SparseVegetation.

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Eriogonum pauciflorum - Gutierrezia sarothrae Badlands Sparse Vegetation

COMMON NAME	Small-flowered Wild Buckwheat - Snakeweed Badlands Sparse Vegetation
SYNONYM	Wild Buckwheat- Snakeweed Badlands Sparse Vegetation
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Unconsolidated material sparse vegetation (VII.C)
PHYSIOGNOMIC GROUP	Sparsely vegetated soil flats (VII.C.4)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (VII.C.4.N)
FORMATION	Soil slumps or landslides (VII.C.4.N.a)
ALLIANCE	ERIOGONUM PAUCIFLORUM SPARSE VEGETATION ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Terrestrial

RANGE

Badlands National Park

The Small-flowered Wild Buckwheat - Snakeweed Sparse Vegetation type occupies badland formations, which cover approximately 45% of the park. Badlands formations are exposed as spires, cliffs, ridges, slopes, narrow gorges, buttes, mounds, fans, and drainages.

Globally

In Badlands National Park, South Dakota, this community type occupies badland formations, which cover approximately 45% of the park (Von Loh *et al.* 1999). It is probably found in other badlands habitats in the Northern Great Plains.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

This type is typically found on silty/sandy outwash fans newly deposited by eroding badlands formations. These formations include Cretaceous Pierre shale, Oligocene Brule siltstone and Chadron clayey mudstone and shale, and Miocene Arickaree sandstone. One stand, comprised of four-wing saltbush, occupies a large badlands flat and erosion fan.

Globally

In Badlands National Park, South Dakota, this type is typically found on silty/sandy outwash fans newly deposited by eroding badlands formations. These formations include Cretaceous Pierre shale, Oligocene Brule siltstone and Chadron clayey mudstone and shale, and Miocene Arickaree sandstone. One stand, comprised of four-wing saltbush, occupies a large badlands flat and erosion fan (Von Loh *et al.* 1999).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Short Shrub	*Opuntia polyacantha*, *Gutierrezia sarothrae*, *Eriogonum pauciflorum*
Herbaceous	*Cryptantha thyrsifolia*, *Atriplex argentea*, *Grindelia squarrosa*

Globally

Stratum	Species
Short Shrub	*Eriogonum pauciflorum, Gutierrezia sarothrae, Opuntia polyacantha*
Forb	*Atriplex argentea, Cryptantha thyrsiflora, Grindelia squarrosa*

CHARACTERISTIC SPECIES

Badlands National Park

Eriogonum pauciflorum, *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Grindelia squarrosa*, *Atriplex argentea*, *Atriplex canescens*, *Cryptantha thyrsifolia*

Globally

Atriplex argentea, Atriplex canescens, Cryptantha thyrsiflora, Eriogonum pauciflorum, Grindelia squarrosa, Gutierrezia sarothrae, Opuntia polyacantha

OTHER NOTABLE SPECIES

Forb ***Eriogonum visheri***

VEGETATION DESCRIPTION

Badlands National Park

The small-flowered wild buckwheat - snakeweed type rarely exceeds 10% vegetative cover and is often less than 5%. On level terrain, the vegetation is relatively evenly distributed, but on steeper slopes and cliffs the vegetation may grow in patches and in rows or seams. Plant species that are nearly always present include small-flowered wild buckwheat (*Eriogonum pauciflorum*), snakeweed (*Gutierrezia sarothrae*), prickly pear cactus (*Opuntia polyacantha*), curlycup gumweed (*Grindelia squarrosa*), silver spearscale (*Atriplex argentea*), and cat'seye (*Cryptantha thyrsifolia*). *Atriplex canescens* (four-wing saltbush) shrubs were

observed throughout the type, but were typically short-statured and scattered in distribution. One stand, comprised of large four-wing saltbush (*Atriplex canescens*) shrubs, covered approximately two hectares, with shrub cover approximately 5%. Total vegetative cover is approximately 45% (mostly due to a heavy infestation of the exotics yellow sweetclover (*Melilotus officianalis*), white sweetclover (*Melilotus alba*), Japanese brome (*Bromus japonicus*), and cheatgrass (*Bromus tectorum*). Other associates in this stand include snakeweed (*Gutierrezia sarothrae*), western wheatgrass (*Pascopyrum smithii*), and blue grama (*Bouteloua gracilis*).

Globally
This badlands community type rarely exceeds 10% vegetative cover and is often less than 5%. On level terrain, the vegetation is relatively evenly distributed, but on steeper slopes and cliffs the vegetation may grow in patches and in rows or seams. Plant species that are nearly always present include the dwarf-shrubs *Eriogonum pauciflorum, Gutierrezia sarothrae, Opuntia polyacantha, Atriplex argentea*, *Cryptantha thyrsifolia*, and the forb *Grindelia squarrosa*. *Atriplex canescens* dwarf-shrubs were observed throughout the type, but were typically short-statured and scattered in distribution (Von Loh *et al.* 1999).

CONSERVATION RANK G?.

DATABASE CODE CEGL005270

MAP UNITS The small-flowered wild buckwheat - snakeweed type is the common association of the Badlands Sparse Vegetation Complex, Map Class 2, on the vegetation map. This association is not mapped separately from other, minor components of the complex. The four-wing saltbush stand is also placed in this type, and thus within the Badlands Sparse Vegetation Complex. No separate map class was created for this stand.

SIMILAR ASSOCIATIONS
Artemisia longifolia Badlands Sparse Vegetation (This badlands sparse vegetation type contains some of the same species.)
Badlands Sparse Vegetation Complex (This is a badlands complex of which this association is a part.)

COMMENTS
Badlands National Park
The Small-flowered Wild Buckwheat - Snakeweed Sparse Vegetation type occupies naturally eroded features of the Pierre shale, Brule siltstone, and Chadron clayey mudstone and shale formations. The vegetation is evenly distributed across relatively flat and rolling sites. Badlands formations shed water rapidly following precipitation events and reflect a tremendous amount of solar energy. Many sites were visited, and the type was well-surveyed during preparation of the vegetation map.

Large four-wing saltbush (*Atriplex canescens*) shrubs growing in a stand were only observed at one location within the park, at the southern boundary of the North Unit, approximately 400 meters west of the Conata Basin Road. The stand covers approximately two hectares. During aerial photointerpretation, these shrubs were mistakenly identified as greasewood (*Sarcobatus vermiculatus*) shrubs, but this identification was modified following a verification survey. For the purpose of classification, the stand is placed under the badlands sparse vegetation complex, per the request of park natural resource managers.

REFERENCES
Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota (Final Report). Technical Memorandum No. 8260-00-02. U.S. Bureau of Reclamation Technical Service Center. Denver Colorado.

Great Plains Badlands Sparse Vegetation Complex

COMMON NAME Great Plains Badlands Sparse Vegetation Complex
SYNONYM Great Plains Badlands Complex
PHYSIOGNOMIC CLASS ()
PHYSIOGNOMIC SUBCLASS ()
PHYSIOGNOMIC GROUP ()
PHYSIOGNOMIC SUBGROUP ()
FORMATION ()
ALLIANCE

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Terrestiral

RANGE

Badlands National Park

Badland formations are widespread within Badlands NP, covering approximately 45% of the park area, and are exposed as spires, cliffs, ridges, slopes, narrow gorges, buttes, mounds, fans, and drainages.

Globally

This complex is found in the badlands formations of the western Great Plains of the United States and Canada.

ENVIRONMENTAL DESCRIPTION

Badlands National Park

The Badlands Sparse Vegetation Complex is found on eroded formations of Cretaceous Pierre shale, Oligocene Brule siltstone and Chadron clayey mudstone and shale, and Miocene Arickaree sandstone. Brule formation siltstone is often capped by Rocky Ford volcanic ash and may also contain veins of chalcedony. Soils are undeveloped, poor, loose, and easily eroded; the topography ranges from flat to vertical.

Globally

Badlands are produced by a combination of factors, including elevation, type of rainfall, carving action of streams, and a particular material. Badlands are basically a type of mature dissection with a finely-textured drainage pattern and steep slopes. Badlands can only form where the land lies well above its local base level. The land must also be easily erodable, or vegetation cover will stabilize the surface. An arid climate will also discourage vegetation growth and will tend to have infrequent, but torrential, rains with great eroding action. In the Great Plains, the geologic formations forming the badlands complex include Cretaceous shales, Oligocene siltstones, sandstones, and cleyey mudstones (Von Loh *et al.* 1999). The soils in the Great Plains badlands complex are generally poorly consolidated clays with bands of sandstone or isolated conglomerates (Froiland 1990).

MOST ABUNDANT SPECIES

Badlands National Park

Stratum	Species
Shrub	*Chrysothamnus nauseosus*, *Gutierrezia sarothrae*, *Eriogonum pauciflorum*
Herbaceous	*Oenothera cespitosa*, *Atriplex argentea*, *Grindelia squarrosa*

Globally

Stratum	Species
Short Shrub	*Eriogonum pauciflorum, Gutierrezia sarothrae, Opuntia polyacantha*
Forb	*Atriplex argentea, Cryptantha thyrsiflora, Grindelia squarrosa*

CHARACTERISTIC SPECIES

Badlands National Park

Eriogonum pauciflorum, *Gutierrezia sarothrae*, *Chrysothamnus nauseosus*, *Sarcobatus vermiculatus*, *Atriplex canescens*, *Artemisia longifolia*, *Grindelia squarrosa*, *Atriplex argentea*, *Oenothera cespitosa*

Globally

Atriplex argentea, Atriplex canescens, Cryptantha thyrsiflora, Eriogonum pauciflorum, Grindelia squarrosa, Gutierrezia sarothrae, Opuntia polyacantha

OTHER NOTABLE SPECIES

Globally

Stratum	Species
Forb	*Astragalus barrii, Eriogonum visheri, Oenothera cespitosa*

VEGETATION DESCRIPTION

Badlands National Park

The Badlands Sparse Vegetation Complex rarely exceeds 10% vegetative cover and is usually <5% vegetative cover. On most level terrain, the vegetation is relatively evenly distributed, but on steeper slopes and cliffs the vegetation may grow in patches and in rows or seams. Plant species that are often present include small-flowered wild buckwheat (*Eriogonum pauciflorum*), snakeweed (*Gutierrezia sarothrae*), rabbitbrush (*Chrysothamnus nauseosus*), curlycup gumweed (*Grindelia squarrosa*), and gumbo lily (*Oenothera cespitosa*). Other, less common species include *Atriplex canescens*, *Artemisia longifolia*, *Grindelia squarrosa*, and *Atriplex argentea*.

Globally

This badlands community complex varies from stands with virtually no vegetation (eroding slopes and badland walls) to stands that may exceed 10% vegetative cover, but more often are less than 5%. On level terrain, the vegetation is relatively evenly distributed, but on steeper slopes and cliffs the vegetation may grow in patches and in rows or seams. Plant species that are nearly always present include the dwarf-shrubs *Eriogonum pauciflorum, Gutierrezia sarothrae, Opuntia polyacantha, Atriplex argentea*, and *Cryptantha thyrsifolia*, and the forb *Grindelia squarrosa*. *Atriplex canescens* dwarf-shrubs were observed throughout the type, but were typically short-statured and scattered in distribution (Von Loh *et al.* 1999). *Eriogonum visheri*, a spring annual, is a rare plant found primarily in badlands in the Dakotas (Froiland 1990). *Astragalus barrii* is another uncommon Great Plains species that is associated with these badlands habitats (Froiland 1990).

CONSERVATION RANK G5. This badlands complex is somewhat restricted in distribution, occurring in selected localities where geologic conditions are right for its formation, but it is a rugged, persistent type, with extensive areas protected.

DATABASE CODE CECX002004

MAP UNITS The Badlands Sparse Vegetation Complex is mapped as a single unit, Map Class 2 (Badlands Sparse Vegetation Complex) on the vegetation map. None of the 4 component associations were mapped separately.

SIMILAR ASSOCIATIONS

COMMENTS

Badlands National Park

Many badlands sparse vegetation sites were visited, and the complex was well-surveyed into four component associations during preparation of the vegetation map. These four associations are: *Artemisia longifolia* Badlands Sparse Vegetation, *Eriogonum pauciflorum - Gutierrezia sarothrae* Badlands SparseVegetation, Eroding Great Plains Badlands Sparse Vegetation, and Shale Barren Slopes Sparse Vegetation. Each association is described elsewhere in this report.

The Badlands Sparse Vegetation Complex occupies naturally eroded features of the Pierre shale, Brule siltstone, and Chadron clayey mudstone and shale formations. The vegetation is evenly distributed across relatively flat and rolling sites, but is patchy or even linear on steeper slopes and along drainages. Many truly barren cliffs, slopes and mounds are present. Badlands formations shed water rapidly following precipitation events and reflect a tremendous amount of solar energy.

Globally

Four associations are currently included in the complex, based on work in South Dakota: CEGL002050, CEGL002195, CEGL002294, CEGL00005270. Other associations may be added with further range-wide review: e.g. CEGL000993.

REFERENCES

Froiland, S.G. 1990. Natural History of the Black Hills and Badlands. The Center For Western Studies, Augustana College, Sioux Falls, South Dakota. 224 pp.

Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota (Final Report). Technical Memorandum No. 8260-00-02. U.S. Bureau of Reclamation Technical Service Center. Denver Colorado.